

**PRESENT SITUATION OF ENVIRONMENTAL
MANAGEMENT PRACTICES IN DIFFERENT
MANUFACTURING INDUSTRIES OF BANGLADESH**

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JUNE, 2013

**Present Situation of Environmental Management Practices in
Different Manufacturing Industries of Bangladesh**

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June, 2013

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It is hereby declared that this Project Report or any part of it has not been submitted elsewhere for the award of any degree or diploma.

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Dedicated to my mother

ACKNOWLEDGEMENT

The author wishes to express his deepest gratitude to Dr. Md. Delwar Hossain, Professor, Department of Civil Engineering, BUET for his continuous support and guidance during the course of this research work starting from development of the research proposal to writing this thesis. His careful reading of the draft thesis, valuable comments, criticism and constructive suggestions greatly contributed to the improvement of the thesis.

The author expresses his profound gratitude to Dr. A.B.M Badruzzaman, for his valuable advice and kind cooperation and thanks to Dr. Tanvir Ahmed for his invaluable support and encouragement. The author is also grateful to the Head of Civil Engineering Department, BUET for issuing necessary letters to the industries interviewed.

The author wishes to thank all the officers of manufacturing industries in Bangladesh who had provided with the valuable data of their industries and spared their valuable time during the interview. The author also expresses his thanks to the management of the industries who had let their officers to provide with the data needed for this research work.

The author also expresses his sincere thanks and indebtedness to Engineer Shaikh Obaidullah Al Mahmood, Research Officer, Department of Environment, Ministry of Environment & Forest, Bangladesh, Engineer Elias Hossain and Mr. Md. Monwar Hossain, Consultants, Green Watch Consultants Ltd. for their suggestions and for sharing their experiences about EM practices in Bangladesh.

The author is grateful to his family members, colleagues and friends for their cooperation and companionship extended to him during this study.

The author also conveys his sincere thanks to all support staffs of Civil Engineering Department for their services and support during the course of this research work.

ABSTRACT

The main objective of the study was to investigate the drivers and barriers of implementing environmental management system in manufacturing industries of Bangladesh. The study also investigated the current environmental management initiatives taken by different manufacturing industries in Bangladesh and their motivation for adopting the system as well as their level of compliance with the local environmental legislation. To achieve these objectives a questionnaire survey was carried out. A conceptual framework was developed by the common perception of the implementation of EMS in Bangladesh at the outset of the research to frame the study and find suitable literature as well as to design the questionnaire. The questionnaire was primarily developed from the conceptual framework and from the review of the relevant literature.

A convenient purposive sampling method was employed to collect data from industries located mainly in industrially populated areas like Dhaka, Chittagong, Gazipur and Narayanganj and popular in their respective manufacturing field. From the study it was found that major drivers of implementing EMS in the manufacturing industries of Bangladesh were international acceptance, compliance to local environmental legislation, international trading, pressure from the customers, production cost reduction and company's policy for environmental safeguard. The major barriers identified from the study were complexity in the process of EMS, management ignorance of its existence, lack of government incentives and awareness, lack of education and training, high investment and maintenance cost, ignorance of government regulations and socio-economic culture. Results also show that most of the manufacturing industries have developed some from of EMS like waste management, pollution control and energy conservation in their operations. From this study it was realized that manufacturers are still reluctant to implement EMS in the industries.

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LIST OF ABBREVIATION

Abbreviations	Elaborations
BEQS	Bangladesh Environment Quality Standards
BS	British Standard
BBS	Bangladesh Bureau of Statistics
BSI	British Standards Institute
BSTI	Bangladesh Standards and Testing Institution
DO	Dissolved Oxygen
DoE	Department of Environment
EIA	Environmental Impact Assessment
EKC	Environmental Kuznet's Curve
EM	Environmental Management
EMAS	Eco-Management and Audit Scheme
EMS	Environmental Management System
EU	European Union
GATT	General Agreement on Trade and Tariff
GoB	Government of Bangladesh
HACCP	Hazard Analysis and Critical Control Points
IEE	Initial Environmental Examination
ISO	International Organization for Standardization
LDC	Least Developed Countries
MNC	Multi-National Corporation
NCS	National Conservation Strategy
NEMAP	National Environment Management Action Plan
UFS	Unilever Environmental Care Framework of Standard
UN	United Nations
WTO	World Trade Organization

CHAPTER 1

INTRODUCTION

1.1 General

Environmental issues can no longer be ignored by the manufacturing industries. Companies are facing increasingly stringent legislative controls and rising utility and raw material costs. Efficient and effective use of raw materials and improved process operations are vital if companies are to survive in competitive market. Pressure is also being exerted by suppliers and customers for companies to reduce their negative environmental impact. All these factors mean that environmental issues should be an essential part of business plan.

Setting up an environmental management system (EMS) will provide a company with a framework through which its environmental performance can be controlled and improved. One can either develop its own EMS or follow the guidelines laid down in an international standard or local standard set up by the government. An EMS can help one to identify opportunities to reduce operating costs through reduced waste generation and reduced use of water and other utilities. According to Khanna and Anton (2002) EMS represents an organizational change within firms and a self-motivated effort at internalizing environmental externalities by adopting management practices that integrate environment and production decisions, which identify opportunities for pollution reduction and enable the firm to make continuous improvements in production methods and environmental performance.

Standards for environmental management systems have been developed and evolving for several years (Brorson and Larsson, 1999). The British Standards Institution (BSI) introduced the first standard for environmental management in 1992 (BS 7750). The International Organization for Standardization (ISO) introduced the ISO 14000 series in September 1996 and it specifies the requirements for an EMS (Clements, 1996, Brorson and Larsson, 1999). Clement (1996) notes that, the standard applies to those environmental aspects over which the firm either has control or could be expected to have an influence on. Aboulnaga (1998) pointed out that, the adoption and use of an EMS can be a source of competitive advantage to industries and organizations wishing to compete on the

international stage. Roy and Vezina (2001) also show that environmental initiatives can be used to enhance a firm's innovative capability. Sheldon (1997) also shows that ISO 14001 has been heartily welcomed by people in government, business and academia. It is believed globally that the standard is useful and one that augurs well for the future of environmental management (Moxen and Strachan, 2000). Other proponents of ISO 14001 like Stapleton et al (2001) argued that the standard could act as a framework for significantly improving organizational performance. By adopting and being certified, a company can improve its market share and reduce expenses related to environmental taxes, energy, waste, water usage, emissions and fines.

After its independence in 1971 from Pakistan, Bangladesh embarked on massive industrialization. Establishment of Industries is being encouraged for rapid economic development of the country. Most of these factories are located in the urban areas like Dhaka, Narayanganj, Narshingdi and Chittagong (BBS, 2010). At present a number of environmental problems have been reported and attributed to industrial establishments in Bangladesh. According to a World Bank study, the four major rivers near Dhaka-Shitalakhya, Balu, Turag and the Burignanga – receive more than 1.5 million cubic metres of wastewater every day, from the surrounding industrial units. The report suggests that the improper treatment of the wastewaters by a number of factories, result in the discharge of highly toxic wastes that cause serious damage to the ecology and aquatic life. More than 30 to 40 lacs people suffer from the consequences of poor water quality in the river system caused by untreated industrial waste. In January 2011, the concentration of dissolved oxygen (DO) of Buriganga was found almost 0 mg/L which is much less than the minimum acceptable standard value (5 mg/L) for the river (Banani Biswas and Takeshi Hamada 2013). Textiles, dyeing, tannery, printing, washing and pharmaceuticals industries are main polluters. People are suffering from different health problems. A qualitative assessment found that about 20 types of diseases appeared to be highly correlated with industrial water pollution. It affirmed that these types of illness have been increasing in the last ten years (Ahmed, 2012). Industrial environmental management has now become a very important issue for the country. This concern has prompted manufacturing industries of Bangladesh for using some form of EMS as an option to environmental management. The study would help industries of Bangladesh to get EM practices in their operations and relate it to the current state of environmental problems.

1.2 Objectives

The main objective of the study is to investigate the drivers and barriers of implementing EMS in manufacturing industries of Bangladesh. This study also investigates the current environmental management initiatives taken by manufacturing industries in Bangladesh and their motivation for adopting the system. The specific objectives of the study are to find out:

- i) the EMS implemented in each manufacturing industry
- ii) the drivers, barriers and benefits of adopting an EMS
- iii) the level of compliance with the local environmental legislation

1.3 Scope of the Study

This study focuses on the manufacturing industries all over Bangladesh. A Convenient sampling method was employed to collect data from industries for this purpose and industries, irrespective of location, interviewed were medium to large industries (MOI, 2010) as defined in industrial policy of Bangladesh.

1.4 Outline of the Study

The study is divided into five chapters. The first chapter is the introductory chapter and describes the background for adopting EM practices in industrial operations, impact of industrial environmental problems in Bangladesh; the objectives and scope of the study.

Second chapter illustrates about study related laws, rules and regulations of Bangladesh; reviews literature on environmental management system (EMS) and the ISO 1400 series; history and development of ISO 14001; benefits and problems of ISO 14001; ISO 14001 and other EM practices in Bangladesh.

Chapter three develops methodology, conceptual framework of EMS implementation in Bangladesh to construct questionnaire; includes sampling method, justification and limitation of the study.

Chapter four discusses about the results and findings of the study as well as compares the results with existing literature and practices.

Last chapter of this study concludes about the results and suggests some recommendations for further study.

A sample questionnaire is annexed at the end of this paper.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

A very important element in understanding environmental management is to understand what the environment is (Hewitt and Gary, 1998). ISO defined the environment as “the surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans and their interrelation” (ISO, 1996). Environmental Management (EM) can be said to mean different thing to different people, however Hewitt and Gary (1998) defined it as “management of an organization’s or company’s impact on the environment”. Therefore, EM is ‘the process of reducing the environmental impact of an organization or people’s activities through the control of all aspects of their operation that can cause or lead to an impact on the environment.

Industrial environmental management has now become a very important issue for the country. This concern has prompted manufacturing industries for using some form of Environmental Management System (EMS) as an option to environmental management. The present trend in industrial environmental management is towards prevention rather than the control of pollution. Bangladesh has put in place some comprehensive legislation and regulations on environmental protection as well as some form of supporting institutional infrastructure. The next section of this chapter illustrates about study related laws, rules and regulations of Bangladesh and the following deals with EMS in general and ISO 14001 particular.

2.2 Laws, Rules and Regulations: Bangladesh Perspectives

Bangladesh has established certain policies, acts and rules for the betterment of its industrial development, environmental safeguard and best utilization of resources and workers occupational safety as well as to increase productivities of the industries. Among these some important policies, rules and regulations are discussed in the following sections.

2.2.1 Environmental Policy (1992)

Bangladesh National Environmental Policy of 1992 sets out the basic framework for environmental action, together with a set of broad sectoral action guidelines. The Environmental Policy provides the broader framework of sustainable development in the country. It also states that all major establishments including setting up of an industrial establishment, which will have a bearing on the environment, must undertake an IEE / EIA before they initiate the project. The Environmental Policy delineates the Department of Environment (DoE), as the approving agency for all such IEE / EIA's to be undertaken in the country. Policies of fifteen sectors are described in the Policy.

2.2.2 Industrial Policy (1999)

The National Industrial Policy, 1999 aims to ensure a high rate of investment by the public and private sectors, a strong productive sector, direct foreign investment, development of labour intensive industries, introduction of new appropriate technology, women's participation, development of small and cottage industries, entrepreneurship development, high growth of export, infrastructure development and environmentally sound industrial development.

WTO guidelines have been proposed to be followed in the Industrial Policy. Following the guidelines may result in conflicts with intellectual property rights. Guidelines for mitigating such possible conflicts are absent in the policy document. No specific guidelines are given for sustainable extraction and utilization of raw materials for different industries.

2.2.3 Industrial policy (2010)

This new policy seeks to make the industrial sector environment-friendly since environmental pollution control remains still a challenge in manufacturing industries particularly for effluent treatment and its effects on public health. It lays strong emphasis on the protection of the environment and directs manufacturing enterprises to control environmental pollution by setting up effluent treatment plants (ETPs) and strictly comply with environment-related laws and regulations. Government will take necessary measures for effective enforcement for proper running of ETP in the industries and ensure that the

industrialization process is environment-friendly and conforms to specific WTO agreements and standards.

2.2.4 National Conservation Strategy (NCS), 1992

National Conservation Strategy (NCS) was drafted in late 1991 and submitted to the Government in early 1992. This was approved in principle. Major relevant recommendations are:

- To use minimum possible area of land in exploration sites;
- Rehabilitate site when abandoned;
- Technology assessment for selection of appropriate technology; and
- To take precautionary measures against environmental pollution from liquid effluent, condensate recovery and dehydration plants.

2.2.5 National Environmental Management Action Plan (NEMAP), 1995

The National Environmental Management Action Plan (NEMAP) is a wide ranging and multifaceted plan which builds on and extends the statements set out in the National Environmental Policy (1992). NEMAP was developed to address environmental issues and management requirements for a period from 1995 to 2005 and set out the framework within which the recommendations of the National Conservation Strategy (NCS) are to be implemented. NEMAP has the broad objectives of:

- Identification of key environmental issues affecting Bangladesh.
- Identification of actions necessary to halt or reduce the rate of environmental degradation.
- Improvement of the natural and built environment.
- Conservation of habitats and bio-diversity.
- Promotion of sustainable development; and
- Improvement in the quality of life of the people.

2.2.6 The Bangladesh Environmental Conservation Act (ECA), 1995 (Amended in 2000, 2002 & 2010)

The Bangladesh Environment Conservation Act of 1995 (ECA '95) is currently the main legislation in relation to environment protection in Bangladesh. This Act is

promulgated for environmental conservation, environmental standards development and environmental pollution control and abatement. It has repealed the Environmental Pollution Control Ordinance of 1977. The main objectives of Environmental Conservation Act of 1995 are:

- Conservation and improvement of the environment; and
- Control and mitigation of pollution of the environment.

The main strategies of Environmental Conservation Act of 1995 can be summarized as:

- Declaration of ecologically critical areas and restriction on the operations and processes, which can or cannot be carried/initiated in the ecologically critical areas;
- Regulations in respect of vehicles emitting smoke harmful for the environment;
- Regulation of the industries and other development activities' discharge permits;
- Promulgation of standards for quality of air, water and soil for different areas;
- Promulgation of a standard limit for discharging and emitting waste;
- Formulation and declaration of environmental guidelines; and
- Environmental Clearance.

Bangladesh Environmental Conservation Act (Amendment 2000)

This amendment of the Act focuses on:

- Ascertaining responsibility for compensation in cases of damage to ecosystems,
- Increased provision of punitive measures both for fines and imprisonment and
- Fixing authority on cognizance of offences.

Bangladesh Environmental Conservation Act (Amendment 2002)

This amendment of the Act elaborates on:

- Restriction on polluting automobiles,
- Restriction on the sale and production of items harmful to environment,

- Assistance from law enforcement agencies for environmental actions,
- Break up of punitive measures; and
- Authority to try environmental cases.

Bangladesh Environmental Conservation Act (Amendment 2010)

This amendment of the Act focuses on:

- Demarcation of wetlands and water bodies,
- Restriction on hazardous waste import, transportation, storage etc.,
- Prevention of cutting of hills, mountains; and
- Declaration of Ecologically Critical Areas.

2.2.7 The Environmental Conservation Rules (ECR), 1997

These are the first set of rules, promulgated under the Environmental Conservation Act of 1995 (so far there have been four amendments to this set of rules - February and August 2002, April 2003 and 2010). The Environmental Conservation Rules of 1997 has provided categorization of industries and projects and identified types of environmental assessments needed against respective categories of industries or projects.

Among other things, these rules set (i) the National Environmental Quality Standards for ambient air, various types of water, industrial effluent, emission, noise, vehicular exhaust etc., (ii) the requirement for and procedures to obtain environmental clearance, and (iii) the requirement for IEE / EIA's according to categories of industrial and other development interventions.

2.3 The Environmental Clearance Procedures in Bangladesh

The environmental clearance process in Bangladesh has three main tiers:

- **Screening:** Screening decides whether the EIA process should be applied to a development project. It also helps to determine the type for which whether an IEE would be sufficient or a detailed EIA should be resorted to.
- **Initial Environmental Examination (IEE):** The IEE helps to understand the potential extent of environmental changes and the ways to mitigate them, as well as past experiences or standard operating practices.

- **Detailed EIA:** The EIA procedure carries out a detailed examination of impacts by conducting relevant surveys and monitoring studies, applying impact prediction tools and ensuring the effectiveness of mitigation and enhancement measures.

2.4 Bangladesh Environment Quality Standard (BEQS)

The ECR'97 determines the environmental standards for air and effluents to which an industry has to adhere. The standards for ambient air, wastewater, stack emissions, ambient noise and odour are illustrated in table 2.1, table 2.2, table 2.3, table 2.4 and table 2.5 respectively. These standards are applicable for all types of industrial or development activities.

Table 2.1: Bangladesh Standards for Ambient Air

Parameter	Standard	Average time
Carbon dioxide (CO ₂)	10 mg/m ³ (9 ppm) (a)	8 hours
	40 mg/m ³ (35 ppm) (a)	1 hours
Lead (Pb)	0.5 µg/m ³	Annual
Oxides of Nitrogen (NO _x)	100 µg/m ³ (0.053 ppm)	Annual
Suspended Particulate Maters (SPM)	200 µg/m ³	8 hours
Particulate Maters (PM ₁₀)	50 µg/m ³	Annual (b)
	150 µg/m ³	24 hours (c)
Particulate Maters (PM _{2.5})	15 µg/m ³	Annual
	65 µg/m ³	24 hours
Ozone (O ₃)	235 µg/m ³ (0.12 ppm)	1 hour (d)
	157 µg/m ³ (0.08 ppm)	8 hours
Sulphur dioxide (SO ₂)	80 µg/m ³ (0.03 ppm)	Annual
	365 µg/m ³ (0.14 ppm)	24 hours (a)

Source: Schedule 2, Environment Conservation Rules, 1997 Bangladesh (amended, July 2005)

Notes:

- *Not to be exceeded more than once per year (a)*
- *The objective is attained when the annual arithmetic mean is less than or equal to 50 µg/m³ (b).*
- *The objective is attained when the expected number of days per calendar year with a 24-hour average of 150 µg/m³ is equal to or less than 1 (c).*
- *The objective is attained when the expected number of days per calendar year with the maximum hourly average of 0.12 ppm is equal to or less than 1 (d).*
- *PM₁₀=Particulate matter with a diameter of not more than 10 microns.*
- *PM_{2.5}= Particulate matter with a diameter of not more than 2.5 microns.*
- *µg/m³ =Micrograms per cubic meter. ppm= Parts per million.*

Table 2.2: Bangladesh Standards for Wastewater from Industrial Units or Project Wastes

Sl No.	Parameters	Unit	Industrial Effluent Quality Standard at Discharge Point		
			Inland Surface Water	Public Sewerage system connected to Treatment at Secondary Stage	Irrigated Land
1	Ammonical nitrogen (as elementary N)	mg/L	50.00	75.00	75.00
2	Ammonia (as free ammonia)	mg/L	5.00	5.00	15.00
3	Arsenic (as As)	mg/L	0.20	0.05	0.20
4	BODs at 20 °C	mg/L	50.00	250.00	100.00
5	Boron	mg/L	2.00	2.00	2.00
6	Cadmium (as Cd)	mg/L	0.05	0.50	0.50
7	Chloride	mg/L	600.00	600.00	600.00
8	Chromium (as total Cr)	mg/L	0.50	1.00	1.00
9	COD	mg/L	200.00	400.00	400.00
10	Chromium (as hexavalent Cr)	mg/L	0.10	1.00	1.00
11	Co per (as Cu)	mg/L	0.50	3.00	3.00
12	Dissolved oxygen (DO)	mg/L	4.5-8	4.5-8	4.5-8
13	Electro-conductivity (EC)	mmho/cm	1200.00	1200.00	1200.00
14	Total dissolved solids (TDS)	mg/L	2100.00	2100.00	2100.00
15	Flouride (F)	mg/L	2.00	15.00	10.00
16	Sulfide (S)	mg/L	1.00	2.00	2.00
17	Iron (Fe)	mg/L	2.00	2.00	2.00
18	Total kjeldahl nitrogen (N)	mg/L	100.00	100.00	100.00
19	Lead (Pb)	mg/L	0.10	1.00	0.10
20	Manganese (Mn)	mg/L	5.00	5.00	5.00
21	Mercury (Hg)	mg/L	0.01	0.01	0.01
22	Nickel (Ni)	mg/L	1.00	2.00	1.00
23	Nitrate (elementary N)	mg/L	10.00	Not Yet Set	10.00
24	Oil and grease	mg/L	10.00	20.00	10.00
25	Phenolic compounds (as C ₆ H ₅ OH)	mg/L	1.00	5.00	1.00
26	Dissolved phosphorus (P)	mg/L	8.00	8.00	15.00
27	Radioactive substance	To be specified by Bangladesh Atomic Energy Commission mg/L			
28	pH		6-9	6-9	6-9
29	Selenium (Se)	mg/L	0.05	0.05	0.05
30	Zinc (Zn)	mg/L	5.00	10.00	10.00
31	Temperature	°C(Summer)	40.00	40.00	40.00
32		°C(Winter)	45.00	45.00	45.00
33	Suspended solids	mg/L	150.00	500.00	200.00
34	Cyanide	mg/L	0.10	2.00	0.20

Source: Schedule 10, Environment Conservation Rules, 1997 Bangladesh

Notes:

- *Inland surface water means drains/ponds/tanks/water bodies/ ditches, canals, rivers, springs and estuaries.*
- *Public sewerage system means treatment facilities of the first and second stage and also the combined and complete treatment facilities.*
- *Irrigable land means such land area, which is sufficiently irrigated by wastewater taking into consideration the quantity and quality of such water for cultivation of selected crops on that land.*
- *Inland surface water standards shall apply to any discharge into a public sewerage system or to a land, if the discharge does not meet the requirements.*

Table 2.3: Bangladesh Standards for Stack Emission from Industrial Projects

<i>Sl. No</i>	Parameters	Standard (mg/Nm³)
1	Particulates (ka) Power station of capacity of 200 MW or more (Kha) Power station of capacity less than 200 MW	150 350
2	Chlorine	150
3	Hydrochloric acid vapor and mist	350
4	Total fluoride (F)	25
5	H ₂ SO ₄ Sulfuric acid mist	50
6	Lead articulates	50
7	Mercury particulates	0.2
8	Sulfur dioxide (SO ₂) H ₂ SO ₄ acid production (DCDA * process) H ₂ SO ₄ production (SCSA * process) Lowest height of stack for H ₂ SO ₄ dispersion: 2.0 Coal based power plant 500 MW or more 200 MW - 500 MW Less than 200 MW 3.0 Boiler Steam per hour-up to 15 tons Steam per hour - more than 15 tons	Kg/ton acid 4 100 275m 220m 14(Q)* 11m 14(Q) ³
9	Oxides of nitrogen 4.0 Nitric acid production 5.0 Gas based power stations 500 MW or more • - 500 MW Less than 200 MW • Metallurgical oven	3 Kg/ton acid 50 ppm 50 ppm 40 ppm 30 ppm 200 ppm
10	Kiln soot and Dust • Blast furnace • Brick kiln • Coke oven • Limekiln	mg/Nm ³ 500 1000 500 250

Source: Schedule 11, Environment Conservation Rules, 1997

Notes:*Q = emission of SO₂ (kg/hour);

DCDA - Double Conversion Double Absorption;

SCSA - Single Conversion Single Absorption

Table 2.4: Bangladesh Standard for Ambient Noise

Sl. No.	Area Category	Standard Values (all values in dBA)	
		Day	Night
1.	Silent Zone	45	30
2.	Residential Area	50	40
3.	Mixed area (basically residential area but used for both commercial and industrial purposes)	60	50
4.	Commercial Area	70	60
5.	Industrial area	75	70

Source: *Schedule 4, Environmental Conservation Rules, 1997, Bangladesh*

Notes:

- *The time from 6 AM to 9 PM is counted as daytime.*
- *The time from 9 PM to 6 AM is counted as night-time.*
- *Area up to a radius of 100 meters around hospitals or educational institutions or special institutions/establishments identified/to be identified by the government is designated as a 'silent zone', where the use of horns of vehicles or other audio signals and loudspeakers are prohibited.*

Table 2.5: Bangladesh Standard for Odour

Parameters	Standard Limit (in ppm)
Acetaldehyde	0.5-5.0
Ammonia	1.0-5.0
Hydrogen Sulfide	0.02-0.2
Methyl Disulfide	0.009-0.1
Methyl-Mercaptan	0.02-0.2
Methyl Sulfide	0.01-0.2
Styrene	0.4-2.0
Tri-methyl-amine	0.005-0.07

Source: *Schedule 8, Environmental Conservation Rules, 1997, Bangladesh*

Notes:

- *The following regulatory limits shall be generally applicable to emission/exhaust outlet pipes with a height of above 5 meters:*
 - $Q = 0.108 \times \text{Het Cm}$ (where Q = gas emission rate in $\text{Nm}^3/\text{hr.}$)
 - Het = Height of exhaust outlet pipe in meter
 - Cm = above mentioned limit in ppm
- *In cases where a special parameter has been mentioned, the lower limit shall be applicable for warning purposes and the upper limit shall be applicable for prosecution purposes or punitive measures.*

2.5 Environmental Management System

An Environmental Management System (EMS) is a set of processes and practices that enable an organization to reduce its environmental impacts and increase its operating efficiency. It is a framework that helps a company to achieve its environmental goals through consistent control of its operations. The assumption is that this increased control will improve the environmental performance of the company. The EMS itself does not dictate a level of environmental performance that must be achieved. Each company's EMS is customized to the company's business and goals.

The ISO 14001 standard defines EMS as “that part of the overall management system which includes the organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy” (ISO, 1996). It can be said that EMS is derived from the environmental policy of an organization. A policy is a set of rules or principles that an individual or organization adopts for a chosen course of action (Hewitt and Gary, 1998). It can be formal and documented. Environmental policy, to these authors, is the “formal and documented set of principles and intentions of an enterprise with respect to the environment”. It serves as the guiding document for environmental improvement and adherence to it is very important to the integrity and success of the EMS.

An EMS helps a company to address its regulatory demands in a systematic and cost-effective manner. This proactive approach can help to reduce the risk of non-compliance and improve health and safety practices for employees and the public. It can also help to address non-regulated issues such as energy conservation and can promote stronger operational control and employee stewardship (US EPA). Basic elements of an EMS are:

- Reviewing the company's environmental goals.
- Analyzing its environmental impacts and legal requirements.
- Setting environmental objectives and targets to reduce environmental impacts and comply with legal requirements.
- Establishing programs to meet these objectives and targets.
- Monitoring and measuring progress in achieving the objectives.
- Ensuring employees' environmental awareness and competence.
- Reviewing progress of the EMS and making improvements.

An EMS encourages a company to continuously improve its environmental performance. The system follows a repeating cycle. The cycle can be represented by a simple diagram as shown in Figure 2.1. The company first commits to an environmental policy, then uses its policy as a basis for establishing a plan, which sets objectives and targets for improving environmental performance. The next step is implementation. After that, the company evaluates its environmental performance to see whether the objectives and targets are being met. If targets are not being met, corrective action is taken. The results of this evaluation are then reviewed by top management to see if the EMS is working. Management revisits the environmental policy and sets new targets in a revised plan. The company then implements the revised plan. The cycle repeats and continuous improvement occurs.

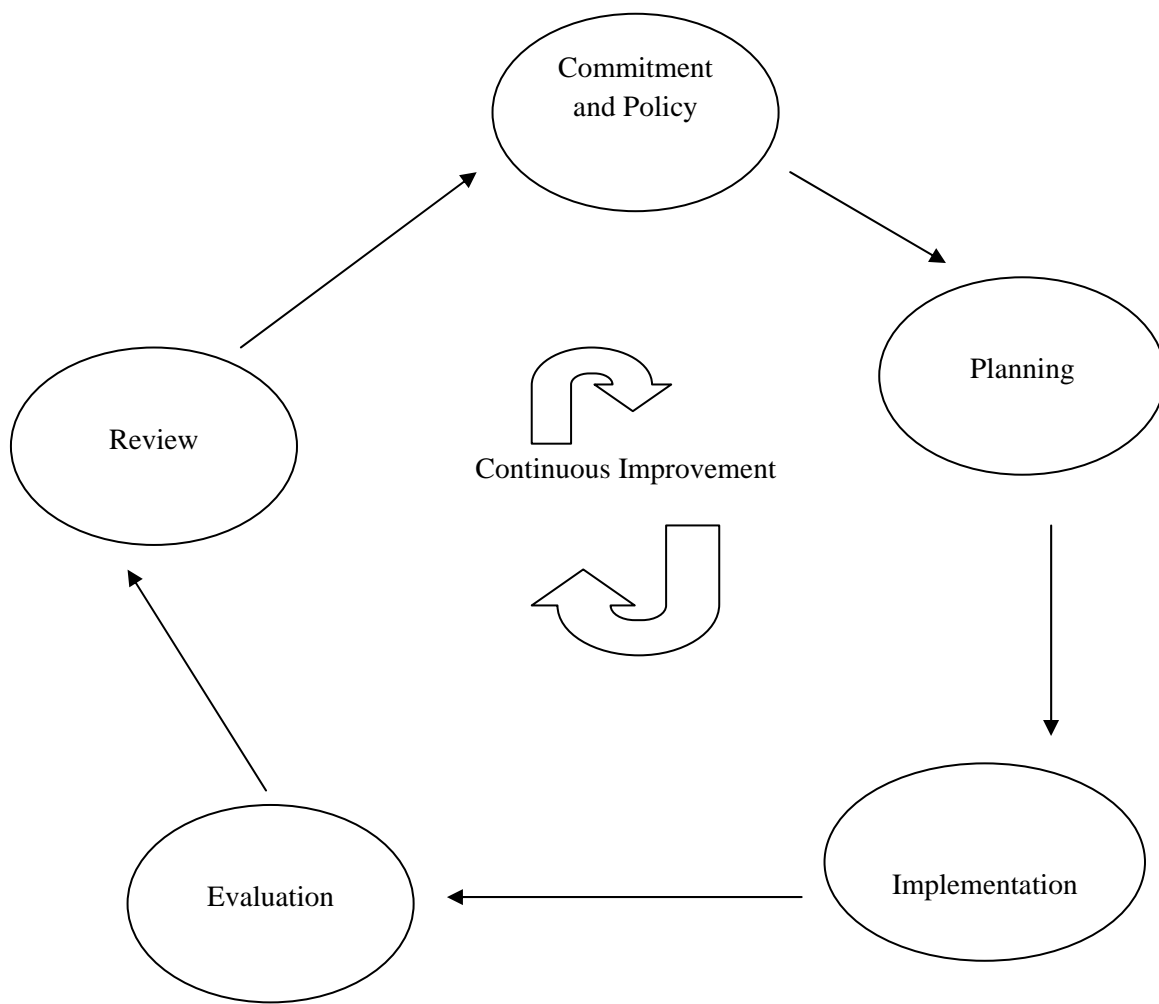


Figure 2.1: The continuous improvement cycle according to US EPA

2.5.1 Components of an EMS

EMS, according to ISO 14001 has four components. It is like a cycle of plan, do, check, and act. If the cycle is adhered to constantly it leads to continuous improvement of the system. Figure 2.2 shows the EMS cycle according to ISO 14001 standard that gives an abstract description of the different components. The design and implementation of an EMS requires a considerable time and effort therefore requiring the commitment of management of the organization. Management needs to communicate their support to the system and emphasize that “they aim to improve their environmental performance”.

An inventory is then needed to assess how the organization currently deals with environmental issues. This is the initial review and it focuses on all elements of which an EMS consists in order to see the activities that have been undertaken and the results. Some of the topics to be treated here according to ISO 14001 include environmental impact, use of resources like raw materials, water and energy, relevant regulations, organizational structures and culture, products and marketing, training and communications, instructions and handling of incidents. Deficiencies will emerge as the system is used and the gaps that need to be filled will become clear.

The ‘Plan’ Phase

This stage is helpful in the formulation of an environmental policy. It serves the direction for future action and communication of the organization’s environmental commitment and targets. According to ISO (1996) environmental policy deals with: the nature, scale and environmental impacts of the organization’s activities, products or services; a commitment to continual improvement and pollution prevention; a commitment to comply with relevant environmental legislation and regulations and other requirements to which the organization subscribes; provides framework for setting and reviewing environmental objectives and targets; it is documented, implemented and maintained; it is communicated to all employees and; it is available to the general public

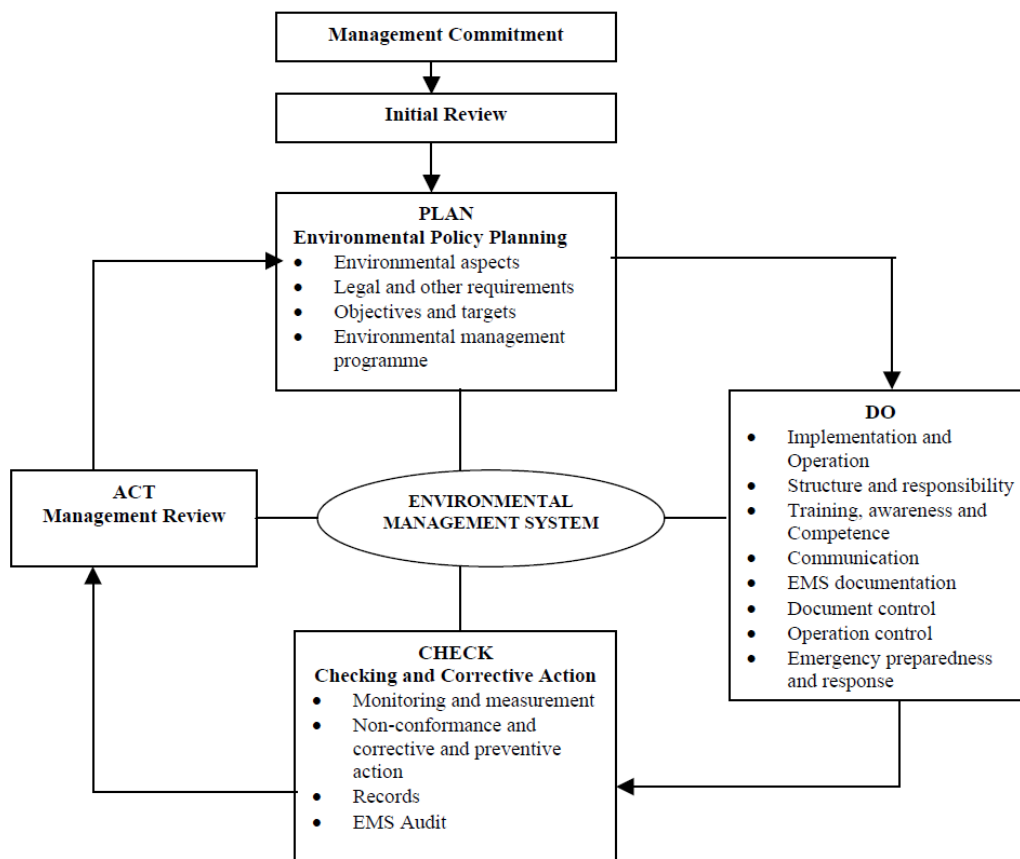


Figure 2.2: EMS Cycle According to ISO 14001

Environmental policy and planning starts with the assessment of the environmental aspects and impacts of the organization's activities, products and services (Kuhre, 1995). Aspects can be said to be the 'potential effects', which can be good or bad. They become impacts when they manifest themselves and lead to changes on the landscape. Aspects can be direct or indirect resulting respectively from the firm's activities or from those of supplies. The organization's environmental programme specifies how the objectives and targets will be met by stipulating the actions, methods, responsibilities, time frames and resources. These should be fully integrated in and coordinated with other areas of management and new structures can be identified if possible to enable total environmental management.

The 'Do' Phase

An organizational chart is defined and laid down at this stage in order to embed the environmental management in the organization. Individual roles and responsibilities are

outlined in addition to the allocation of resources like finance, personnel, skills and technology. The next step is the identification of training needs to build environmental awareness and competence. This can be done from current staff or new employees recruited. Communication, both internally and externally is relevant for an EMS implementation since it helps keep people informed. Communication is best if it is top-down and bottom-up. It directs attention to the fact that environmental management involves more than a system with procedures, instructions, performance indicators, requirements and checks laid down in manuals, plans, schemes and reports (ISO, 1996). Documentation is very important in any EMS since it points to implementation and operation. Document control entails designation of someone to be responsible for revision and change. Operations and activities must be controlled to ensure that policy addressing the most significant environmental aspects is carried out.

The 'Check' Phase

This stage aims at checking how the firm performs in terms of environmental management and if necessary, identify possibilities for improvement and take subsequent action to realize these changes (ISO, 1996). Organizations' operations and activities with respect to significant environmental impacts are to be monitored, their performances are measured and compared with the objectives and targets and compliance with regulations is assessed.

The 'Act' Phase

Management review here aims at making sure that the EMS continues to produce the desired effects as outlined in the policy. Apart from the information derived from audits, other internal reports on performance and incidents, external reports on regulatory and environmental changes and suggestions for improvement received from internal and external sources can play a role for the organization to act upon. The process is then repeated again. The drivers or motivations to use EMS are internal and external involving different forces.

2.5.2 Drivers of EMS

Globalization coupled with industrialization with increasing environmental degradation has compelled a number of firms and organizations to adopt new strategies for sustainability. Business has also come to realize the enormity of their actions on the environment. A number of pressures are now being put on organizations from all corners of the globe. The drivers of EMS implementation in industries and organizations can be grouped into five different actors. They include; the organizations themselves, market, social forces including the public and community, financial organizations and regulatory authorities.

Organizations

Environmental issues have become increasingly important in organization's activities since it acts as insurance for its stakeholders both within and outside (Chan, 1998). Surveys carried out by Banerjee (1998) showed that most managers are in favour of environmental management albeit at different levels. These rising awareness can be traced back to the 1972 Stockholm conference and further by the Rio conference where environmental issues were brought to the forefront of the world. Environmental issues and concerns have thus become very important issues in organization dealings today. Organizations have come to realize the advantages they start to gain by adopting EMS therefore initiating it within themselves. Some of the drivers within organizations include management, staff, parent company and shareholders.

Market

The market these days, especially in developed countries is leading environmental stewardship among firms as most consumers now demand environmental loyalty of the factory before they purchase its products. Environmental friendly goods are being sought and they are willing to pay more for that product. Industries that fail to heed such a call become uncompetitive, therefore prompting them to adopt new strategies towards the environment. This case does not apply to Bangladesh as the market is more preoccupied with cheaper goods than environment friendly ones.

Social forces/community

A community can demand the existence of a good EMS in an organization that they feel is a threat to the environment and their existence. With increasing awareness on the environment these days, society is a force to be reckoned with as far as the environment is a concern especially in the DCs. The activities of environmental non-governmental organizations (ENGOS) are also becoming very vocal and serve as a driver of EMS. In Bangladesh, local communities may demand environmental stewardship but without appropriate ENGO or institutional backing, this will be a mirage. For Example: In 1989, there was a major effort by certain quarters to get the government of Bangladesh allow the import of waste from the USA under the guise of raw material for producing cheap energy. When the process advanced considerably, a section of journalists, academics and NGOs began to voice their concern about the possibility of allowing hazardous wastes to be imported. This led to considerable agitation and media reporting backed by NGOs which eventually caused the government to reconsider the matter. Permission was eventually not granted. This exercise is a useful example of NGOs, academics and media working together to raise concerns about an environmental issue and having an impact. NGOs are working with the government of Bangladesh in environmental management to ensure a safe and better environment for the country. The Bangladesh government has devised policies to ensure the NGOs accountability for environmental management (Ahmed, Z. 2011).

Financial

Financial institutions and insurance companies these days demand the existence of an effective management system like EMS in order to acquire and get insurance. The existence of such a system gives advantages to the company for being granted loan or insurance. Some international financial institutions like the International Monetary Fund (IMF) and the World Bank (WB) are some of such organizations. Green financing contributes to the transition to resource-efficient and low carbon industries i.e., green industry and green economy in general. The banking sector can play a significant role in protecting the environment by financing to high impact environmentally sensitive sectors. Broad objective of green banking is to use resources with responsibility and giving priority

to environment and society. It is not just another Corporate Social Responsibility (CSR) activity rather all out effort to keep this world liveable without much damage. To foster green banking practices in the country, Bangladesh Bank (BB) formulated the Green Banking Policy and strategy framework and Environmental Risk Management Guidelines in a consultative manner. Many banks are now financing environmental friendly projects. BB has introduced a refinance scheme worth about BDT 2 billion to refinance loans to effluent treatment plants (ETPs), solar panels, bio-gas plants and in brick making industries (BB, 2012). People as well demand the existence of such a system before they invest in such an enterprise. Financial law suits can also compel them to adopt EMS in their operations.

Regulatory Institutions

Research has shown that environmental initiative by organizations is driven primarily by external forces, such as regulatory pressures. Porter and van der Linde (1995b) argued that “government regulations may serve in practice as a stimulus to both economic growth and cleaner production, if they are used as a business asset to gain market advantages over competitors”. It has been reviewed in other literature however that “neither positive nor negative effects of environmental regulation on competitiveness were easily detectable” (Jaffe et al. 1995). Porter and van der Linde (1995b) concluded that firms seek to maximize ‘resource productivity’ in response to both regulatory and market pressures. Environmental regulation has been a major factor leading firms putting into effect EM (Kolk, 2000). According to him, some firms with less environmental risks used to focus on compliance to regulations but as EM developed, firms started to move beyond mere compliance.

2.5.3 Barriers of EMS

Motivations are important in promoting EMSs, but the barriers to implementation must be acknowledged and addressed in order to minimise them. The adoption of an environmental management system is a complicated procedure where difficulties can appear in the different stages, acting as barriers for its implementation (Biondi *et al.*, 2000). These can vary depending on the characteristics of the organization, such as, size, business sector, and even country (Biondi *et al.*, 2000; Gerstenfeld and Roberts, 2000). The findings

of the analysis carried out by Hillary (1999), of the thirty-three separate studies that examined the implementation of formal EMSs in industries showed that these barriers could be differentiated between internal and external as follows:

Internal barriers

- **Lack of resources:** including, among others, lack of time, cost constraints and lack of knowledge and specialists in environmental issues.
- **Negative attitudes and company culture:** for instance, inconsistent top management support for EMS, or, a general resistance to change.
- **Inadequate understanding and perception:** such as, low awareness of EMSs, and, lack of knowledge of certifiers' systems, confusion between ISO 14001 and EMAS and their interrelationship.
- **Implementation problems:** including, difficulty in dealing with environmental aspects such as the evaluation and determination of impact significance, and, uncertainty about how to maintain continual improvement. (Hillary, 1999)

External barriers

- **Certifiers' difficulties:** such as, the degree of difficulty in obtaining the certification, and the associated costs, or, the amount of documentation and bureaucracy required.
- **Economic aspects:** including, for example, uncertainty of the value of an EMS in markets, or insufficient benefits and drivers.
- **Lack of support and guidance:** for instance, lack of specific implementation tools and examples, taking into account the different business sectors.
- **Institutional weakness:** for example, lack of promotion of EMSs, of financial support or of a legislative framework. (Hillary, 1999)

Hillary (1999) found that internal barriers were more significant in impeding easy implementation of EMSs in SMEs than the external ones. Among these internal difficulties, lack of human resources and negative company culture were the most cited in the studies. Lack of human resources rather than financial ones was the major barrier found, not only in the implementation of an environmental management system, also in its maintenance, and it increased in importance as the size of the company decreased (Hillary,

1999). The second biggest internal difficulty was an unfavourable company culture. It was the case that organizations that had had negative experiences with one of the ISO 9000 standards showed a negative attitude to ISO 14001 (Hillary, 1999).

However, in the case of large companies, where more resources are available, external barriers seem to be more important than the internal ones. Issues, such as, economic aspects, and, the complexity of the procedure of obtaining the certification, due to the amount of paperwork required, can play a significant role in the implementation of an environmental management system, and also in the choice of its certifier (Sunderland, 1996).

Another external barrier indicated by Hillary (1999), that can play an important role in the implementation, is institutional weakness, for instance, lack of a legislative framework. Similar conclusions to the ones achieved by Hillary (1999) were also found in the research programme carried out by Biondi *et al.* (2000).

The main barrier found was, confirming Hillary's (1999) findings, the indirect costs, such as, the amount of time, or, the lack of human and technical resources. In general, the smaller the enterprise was, the higher the probability that the organization could not implement the EMS by depending only on internal expertise. In addition to this, the stages of the implementation where the SMEs met the most significant problems were the initial environmental review and the definition of objectives and programmes, in part, due to the difficulty of understanding, interpreting and applying the EMS standards, requiring sometimes a technical knowledge of environmental issues. Difficulties were also found in defining the environmental policy and the programmes due to a lack of environmental culture in the organization (Biondi *et al.*, 2000), which was also pointed out by Hillary (1999) as the second biggest barrier encountered by SMEs.

The fact, which has been cited before, that the importance of the barriers increases as the size of the company decreases has been indicated by other authors. For example, a review of studies concerning UK SME's that was carried out by Gerstenfeld and Roberts (2000) showed how the lack of awareness of EMSs increased the smaller the organization was, with micro-sized companies being the least aware. Furthermore, they pointed out lack of knowledge and expertise as important constraints in the implementation of an EMS, as Hillary (1999) and Biondi *et al.* (2000) previously concluded.

The difficulties of the maintenance of an environmental management system were indicated in the analysis of a large aluminium smelting plant certified to ISO 14001 in South Carolina, USA, by Rondinelli and Vastag (2000), who addressed the impacts of the standard three years after its implementation. The main negative impact of maintaining the EMS was the increase of administrative bureaucracy, followed by a lack of customer approval and recognition of the standard (which had been some of the key motivations behind implementing it), and resulted in an imperceptible competitive advantage. Furthermore, another complexity for the company was that ISO 14001 did not ensure compliance as they had expected (Rondinelli and Vastag, 2000).

This imperceptible competitive advantage and therefore minimal market opportunities was also indicated by Steger (2000), in his review of empirical studies on EMS, based on evidence from European organizations that had implemented an environmental management system.

2.6 Approaches to Environmental Management System

Environmental policies/instruments currently in existence include; regulations, incentives, disincentives, marketable permits, liabilities, training, information for firms, information for customers, voluntary agreements and plans. These policies are mainly used in advanced countries. These instruments proved effective in controlling pollution in developed countries but only few policies such as direct regulation and economic measures are being used in Bangladesh.

2.7 The Gap between EMS Theory and Practice

1. Though much has been written on EMS theory, there is inadequacy of documentation and analysis of specific cases of EMS implementation (Kirkland and Thompson, 1998) for adoption. This has placed developing countries at a disadvantage.
2. The practitioners of EMS just introduced the concept with no adequate dissemination of those ideas to the general public.
3. The lack of communication of the ideas in EMS has a number of roots. One, the concept is new; second, the lack of communication can also be attributed to

competition between its practitioners especially those in the developed countries, and lastly, the lack of leadership on the issue (Kirkland and Thompson, 1998).

4. According to the Kirkland and Thompson (1998), the gap between EMS theory and practice has been exacerbated by the dominance of a structural approach to EMS. EMS work has focused on the identification and description of components and frameworks but has not addressed how to put EMS elements together.
5. ISO 14000 provides a list of resources needed in an EMS including general directions for the blending of these resources but fails to describe techniques that may be used to blend the ingredients into a successful whole.
6. The provided information can be said to be good but further information is needed to develop an effective EMS especially in Less Developed Countries (LDCs) like Bangladesh where the practice is not known.
7. Commitment by organizations is a vital component of the system but this has not been catered for in the ISO 14000 series (Kirkland and Thompson, 1998).
8. Some books attempted to guide readers through the process of developing EMS but these are all done in line with developed countries standards and examples with little attention being paid to that of the LDCs.

2.8 The ISO 14000 Series

ISO 14000 is a series of international standards for environmental management. It is the first such series of standards that allows organizations all over the world to pursue environmental efforts and measure performance according to internationally accepted criteria (Hewitt and Gary, 1998). It lays out tools and systems for the management of various environmental obligations and the conduct of product evaluations, without prescribing the goals an organization must achieve (Cascio et al, 1996). Table 2.6 shows the various elements in the series.

Table 2.6: The ISO 14000 Series

Title	Standard
14001	Environmental Management System-Specification with Guidance for Use
14002	Environmental Management System-Guidelines on Special Considerations Affecting Small and Medium Scale Enterprises
14004	Environmental Management System-General Guidelines on Principles, Systems and Supporting Techniques
14010	Guidelines for Environmental Auditing- General Principles of Environmental Auditing
14011	Guidelines for Environmental Auditing-Audit Procedures Part 1: Auditing of Environmental Management Systems
14012	Guidelines for Environmental Auditing-Qualification Criteria for Environmental Auditors
14013/15	Guidelines for Environmental Auditing-Audit Programmes, Reviews and Assessments
14020	Environmental Labels and Declarations-General Principles
14021	Environmental Labels and Declarations-Environmental Labelling- Self Declaration of Environmental Claims-Terms and Definitions
14022	Environmental Labels and Declarations-Environmental Claims-Self Declaration of Environmental Claims - Symbols
14023	Environmental Labelling-Self Declaration of Environmental Claims-Testing and Verification Methodologies
14024	Environmental Labels and Declarations-Environmental Labelling-Type 1-Guiding Principles and Procedures
14031	Environmental Performance Evaluation-Guidelines
14032	Technical Report Type ... –Environmental Management-Environmental Performance Evaluation-Case Studies Illustrating the Use of ISO 14031
14040	Life Cycle Assessment- Principles and Framework
14041	Life Cycle Assessment-Life Cycle Inventory Analysis
14042	Life Cycle Assessment-Impact Assessment
14043	Life Cycle Assessment-Interpretation
14049	Technical Report Type ...-Environmental Management- Life Cycle Assessment-Examples for the Application of ISO 14041
14050	Environmental Management Terms and Definition
14061	Technical Report ...-Guidance to Assist Forestry Organizations In the Use of ISO 14001 and ISO 14004

Source: Hewitt and Gary, 1998

The series aims at providing guidance for developing a comprehensive approach to EM and for standardizing key environmental tools of analysis such as labelling and life cycle analysis. ISO 14001 is the first in the 14000 series as shown in table 2.6. It is aimed at supplementing environmental protection and the prevention of pollution in accordance with socio-economic needs.

2.9 History and Development of ISO 14001

According to ISO (1996), the main purpose of the standard is to provide a systematic, documented, consistent procedure that provides clear evidence of the relationship between organizations' publicly stated environmental policy and the implementation of this policy in practice. The standard specifies a continuous cyclical process consisting of five elements as shown in Figure 2.2.

A major antecedent that led ISO to develop standards can be traced to the British Standards Institute (BSI) publication of the three part quality series-BS 5750. The success of this standard led to the adoption of BS 7750, the first formal systematic and standardized approach to environmental management (Hewitt and Gary, 1998). The BS 7750 was published in 1992 and it was a voluntary management standard. Countries started to produce their own EMS. An initiative began regionally within the EU and the EMAS was negotiated with industry, environmental groups and other interested stakeholders within the environmental field. It was created for businesses interested in voluntary certification to an EMS within the EU. The increase in national standards on the environment compelled ISO to initiate moves on EM standards. ISO embarked on creating standards that are not essentially technical or scientifically based neither limited to a specific region. The success of ISO 9000 led to the development of other standards. It is generally believed however that the ISO 14000 series emerged as a result of both the Uruguay round of the General Agreement on Trade and Tariff (GATT) negotiations and the UN Rio Summit on the environment held in 1992 (Hewitt and Gary, 1998).

2.10 ISO 14001 Developments throughout the World

There is mixed results with respect to ISO 14001 development throughout the world. ISO 14001 achieved success in Europe as a result of the development of other EMS like BS 7750 and EMAS. These standards laid strong foundation for the take off of ISO 14001. In addition, government institutions through the EU promoted the diffusion of EMS in Europe, a phenomena lacking in most developing countries of Africa and Latin America. The size of firms is the major contributor to the development of an effective EMS here. Asia has large MNCs as compared to Africa and Latin America. These large companies are pushing ISO 14001 down their supply chain. China is the leading

developing country with large certification to ISO 14001. Due to its large population many companies established here. These companies are subsidiaries with their parent companies in Europe. To do business with these companies, one has to be certified to the standard. Brazil is also following the same step as China in getting certified, however, this is not the case in other LDCs as they are doing business on a small scale and are mainly import substitution industries.

Table 2.7: Top 10 countries for ISO 14001 certificates - 2010

1	China	69784
2	Japan	35016
3	Spain	18347
4	Italy	17064
5	United Kingdom	14346
6	Korea, Republic of	9681
7	Romania	7418
8	Czech Republic	6629
9	Germany	6001
10	Sweden	4622

Table 2.8: Top 10 countries for ISO 14001 growth - 2010

1	China	14468
2	United Kingdom	3434
3	Italy	2522
4	Czech Republic	1945
5	Korea, Republic of	1838
6	Spain	1820
7	Brazil	1488
8	Romania	555
9	Korea, Democratic Peoples Republic	468
10	Colombia	466

Source: The ISO Survey of ISO 9000 and ISO 14001 Certificates, 2011

Bangladesh had only 2 Companies certified to ISO 14001 in 2001 and 3 ISO 14001 Certified Companies in 2003. Reliable source shows (BSTI, interview) that ISO certification in Bangladesh has an increasing trend. It can be said that there is a positive relationship between the level of industrial development of a country and ISO 14001 certification. Developed countries have embraced EMS as compared to LDCs.

Table 2.9 Number of ISO Certified Companies in Bangladesh

Year	2001	2002	2003	2006	2007	2008	2009	2010
Number	2	3	3	17	17	20	42	120

Source: Deputy Director (certification), BSTI, from filled up ISO Survey form

2.11 Benefits of ISO 14001 Certification

EMS certification is of the management system itself, not the environmental performance (Hewitt and Gary, 1998). ISO 14001 EMS has been heartily welcomed by people in government, business and academia (Sheldon, 1997). A company can develop EMS but may not certify it, however most companies that develop EMS indeed certify it. Certification does not generate instant results (Hewitt and Gary, 1998). Certification of ISO 14001 EMS has the following benefits:

1. ISO 14001 certification gives an external 'stamp' of approval of the environmental management system (EMS) of the organization and proves that the organization's commitment to improve environmental performance is valid. It also proves that industries' activities have been evaluated and accepted by an accredited, independent third party.
2. After ISO 14001 certification the greatest positive impact to the environment will be the reduction of hazardous waste. This would lead to reduction, reuse or recycling, all of which maximize natural resources. There is thus conservation of other natural resources in the process. Hence, the level of compliance with the local environmental regulations would improve.
3. The inspection agency will know that the certified organization cares for the environment and has systems in place even before visiting the operation. This positive relation is extremely valuable and would help foster a better working relationship.
4. By adopting and being certified, organization can reduce expenses related to environmental taxes, energy, waste, water usage, emissions and fines. It leads to long-term cost savings, especially in the area of environmental control and cleanup of incidents. According to Kuhre (1995) certification will not eliminate all cleanup cost. However, it would minimize the number and size of future cleanups.
5. It leads to prevention of suffering and possible death of workers due to mishaps. The costs associated with injuries will also be reduced.

6. It increases public awareness in case of protection of the environment. If an organization improves its EM program, it would surely improve its community relations as well.
7. ISO14000 EMS procedures are proactive environmental actions. It could be communicated to the public, since it is a positive venture. Thus their confidence in the organization will be increased. It creates customer trust and satisfaction.
8. Organizations that obtain the certificate would be able to increase the market share of their products since most customers especially of advanced industrialized countries are environmentally conscious and would be in competitive position in the market because the customers feel more secure that the environment is being catered for.
9. Companies certified to ISO 14001 have market access all over the world. It levels the playing field of international trade bringing more competitors to the scene.
10. Investors these days also try to invest in environment friendly companies. Employment would be created in the home country thereby reducing unemployment thus poverty.
11. Insurance companies these days find it easier transacting business with companies that have effective EMS like ISO 14001 EMS as they view such a company as having limited liability.
12. The standard also provides an effective means of technological development as well as its transfer to other sectors of the industry or the organization.

2.12 Problems with ISO14001 Certification

1. Adopting ISO 14001 might bring benefits and loss to any business activity. The standard has been criticized by a number of companies (Yiridoe et al, 2003).
2. One of the major barriers to certification and development of an effective EMS is that, companies become vulnerable to legal claims as they develop EMS.
3. The development of an EMS creates documentation on environmental performance and these documents can become a basis for court action against an organization that does not go according to its targets (Kolk, 2000). These litigation problems can

create caution on the development of an EMS. The good side however is that, the standard does not mention reporting of environmental performance by companies.

4. Auditors may have access to information on performance and can leak such information out.
5. Some MNCs claim that they have much more sophisticated system in place other than the weak ISO 14001 as such there is no need to certify to ISO 14001 (Kolk, 2000).
6. The system has also been criticized for not focusing on internal control. It has been said that it is deficient in giving guidelines on information needed for internal and external purposes, the organization of the information system and how the system and its information should be verified.
7. The criticism goes further that certification itself does not give guarantee that the management system meets all requirements. For example, it fails to specify limits to energy or resource consumption, emission levels and performance levels other than those of national levels, which in LDCs like Bangladesh are low and not complied with due to weak enforcement mechanisms.
8. The system, it is said does not aim at protecting the environment (Welford, 1998). Certification therefore does not necessarily make a company environmentally perfect or ensure company's constantly improving performance but rather depends on the people who drive it.
9. Another criticism of the system is the high cost required to get certified. Not only the cost but the attendant bureaucracy involved in its preparation and implementation is another cause for a company not to get certification.
10. The yearly auditing of records also adds to the cost. A number of man hours are therefore spent on the certificate.
11. These problems do not help the small and medium scale enterprises in developing countries to get the certificate.

2.13 ISO14001 and Environmental Management in Bangladesh

After its independence in 1971 from Pakistan, Bangladesh embarked on massive industrialization. There was heavy tariff protection of local industries. Some measures such as trade policy reforms, improvement in the tax system and reformation and incentives on foreign investment taken led to an increase in the industrial performance of some industries. New enterprises were formed and government has created some industrial zone and export processing zones to establish industries. Establishment of Industries is being encouraged for rapid economic development of the country. At present a number of environmental problems have been reported and attributed to industrial establishment in the country. It is expected that the current environmental problems would increase unless due attention is given to industrial environmental management.

Industrial environmental management has now become a very important issue for the country. This concern has prompted manufacturing industries for using some form of EMS as an option to environmental management and getting it certified. The use of ISO 14001, a voluntary environmental management option is being offered as a way for environmental management in the country based on its ingrained properties of waste management, emission control, energy conservation and water management, prevention of industrial disasters. Bangladesh needs not follow the path of the industrialized countries of pollute first then develop later as put forward in the Environmental Kuznet's Curve (EKC). The theory implies that during the initial stage of development, some form of environmental degradation occurs but increasing income produces incentives to improve environmental quality (Munasinghe, 1999). The aim is to encourage restructuring of development policy programmes to move on the path of sustainability by flattening the EKC curve for the environmental indicators that are being dealt with. This process is aimed at avoiding the degree of environmental damage in Bangladesh as experienced by industrialized countries during their early periods of development without hindering development (Munasinghe, 1999).

CHAPTER 3

METHODOLOGY

3.1 Introduction

The objective of this study is to investigate the drivers and barriers of implementing EMS in manufacturing industries of Bangladesh. This study also investigates the current environmental management initiatives taken by manufacturing industries in Bangladesh and their motivation for adopting the system. To achieve these objectives a questionnaire survey was carried out. A conceptual framework was developed at the outset of the research to frame the study as well as to design the questionnaire. Field survey was accomplished to collect the primary data from the questionnaire. Then the data was analyzed to obtain the results. Primary data was the main source of information for the study. Some secondary sources of data were also employed. The secondary sources of data included books, published electronic and print journals and information from relevant environmental experts.

3.2 Conceptual Framework

A theoretical conceptual framework is used in research to outline possible courses of action or to present a preferred approach to an idea or thought. Theoretical conceptual frameworks are a type of intermediate theory that attempt to connect all aspects of an inquiry e.g., problem definition, purpose, literature review, methodology, data collection and analysis. Conceptual frameworks can act like maps that give coherence to empirical inquiry. Because conceptual frameworks are potentially so close to empirical inquiry, they take different forms depending upon the research question or problem. In this research, a descriptive conceptual framework was developed to link with the descriptive study. Figure 3.1 shows the conceptual framework developed for the study. This conceptual framework was designed by the common perception of the implementation of EMS in Bangladesh. The box shows indicators and arrow shows the relationship between indicators. The larger box shows common indicators which influence the other indicator. Also the arrow depicts the positive relationship among indicators.

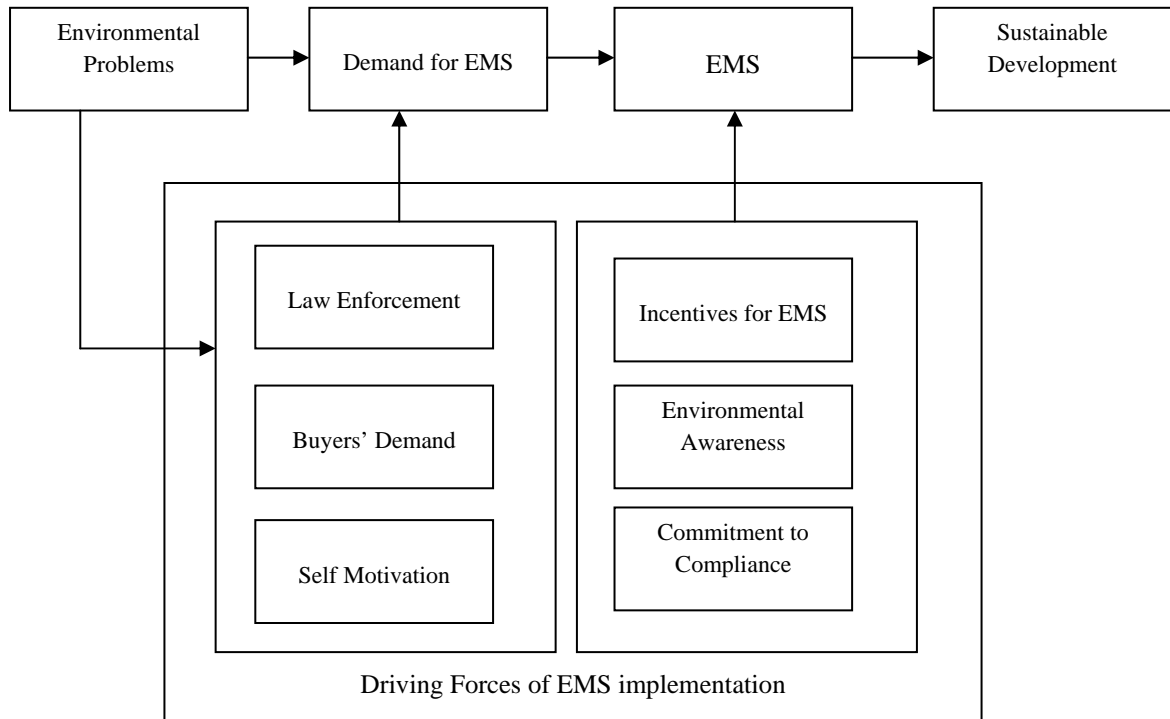


Figure 3.1: Conceptual Framework of EMS implementation in Bangladesh

As this is a descriptive conceptual framework there are some limitations of this model. Other variables which might influence in implementing the EMS would not be revealed and there might some other factors which are interlinking with other or interactive to other might be missing in this model. Barriers of implementing EMS are not shown in the model and how the barriers would influences the model is also absent.

3.3 Instruments

For the acquisition of primary data a questionnaire was administered to the manufacturing industries in the study area. The questionnaire was primarily developed from the conceptual framework that was designed earlier by the common perception of the implementation of EMS in Bangladesh and from the review of the literature that has identified different motivations and barriers of implementing an environmental management system.

3.3.1 Questionnaire Design

The drivers and barriers of implementing an EMS vary depending on the characteristics of the organization, such as, size, or business sector that belong to, and on the certifier, ISO 14001. The objective of this research is to study the motivations and barriers found by manufacturing industries of Bangladesh in the process of implementation of an EMS. For this purpose, two types of information were needed: data about the characteristics of the organizations and information concerning EMS implementation experience in order to establish different relationships between them. A sample of the questionnaire can be found in Annexure I. It was designed based on the justification from the literature review to help achieve the goals of the research and was divided into five different sections with a final part for further personal comments regarding improvement of EMS implementation in industries of Bangladesh and thanks for their help.

The first section provided general information of the organization, such as, the location of the industries, the number of employees, the industrial sector that it belonged to, and the type of certification that it had. This information concerning characteristics of the organization was required because a classification of the organizations by business sector and by size was needed in order to establish relationships with data about EMS implementation experience. Based on the responses to the third question, where the organizations indicated their industrial sector, a categorization of the main sectors that the companies surveyed belonged to was done. The second classification by size was based on the answers to the question on the number of employees whether the company was a SME or a large enterprise (MOI, 2010).

The second section focussed on motivations. This part was intended to investigate the key drivers that motivated the organizations to implement an EMS. Different options were given to the respondents, who selected the appropriate ones. The third section was based on the benefits that the organizations have obtained from their environmental management systems in order to study if their expectations have been realized, and they thought implementation was justified.

The fourth section explored the barriers to implementation. With a similar structure, different options of internal and external barriers were given to the respondents, who indicated the most suitable and ranked them. The objective of this part was to study

the main difficulties that appeared in the implementation process, determining which barriers were more restrictive. One of the major objectives of the study was to find out the level of compliance of manufacturing industries of Bangladesh with the local environmental legislation. Hence, the final section of the questionnaire was designed to investigate industries' compliance level to local legislation.

The questionnaire was then tested with pilot survey and transformed to its final form also by informal discussion held with environmental officers of manufacturing industries and people of organizations responsible to the environment and standardization in the country. Thus the questionnaire was then ready for field survey. It was combined with both closed and open-ended questions.

3.3.2 Questionnaire Survey

In order to carry out the survey most effectively the structured questionnaires were administered personally to human resources responsible to the environment in the respective industries with a covering letter, explaining the reasons of the survey. Some questionnaires were left with those industries in which the questionnaire could not be administered personally. Some interviewees were contacted through e-mail and telephonic call. Telephonic interviews were also conducted after receiving the filled up questionnaires.

3.4 Population and Sampling

A convenient purposive sampling method was employed to collect data from industries located mainly in industrially populated areas like Dhaka, Chittagong, Gazipur and Narayanganj and popular in their respective manufacturing field. Major sectors of industries included food production and processing, cotton and textile, plastic production, pharmaceuticals and iron and steel manufactures. Industries were selected on the basis of their availability and accessibility to the author and their willingness to take part in the survey. Contact with most of the industries was facilitated through personal relationship. Results obtained from 34 industries are used for the study.

3.5 Data Analysis and Presentation

As the number of industries interviewed was small, the study was considered to be exploratory and the data were not analyzed statistically. All the results were collated into a

spreadsheet format. Answers to open questions were categorized in the main responses. Common responses to each question were expressed as a percentage of the total number of replies received, which allowed direct comparability. In addition to this, questions left in blank by the respondents were counted into the total number of replies received. In most cases, the results for each question did not add up to one-hundred percent, due to the fact that most organizations selected more than one option for the same question, or because of a consequence of rounding up figures. The results were then presented in tables, graphs and charts for displaying responses to questions in different formats as appropriate. Frequencies of the various responses are worked out. It is then interpreted and explained in terms of the general trends that emerged from the analysis. Relationships between variables are shown. Inductive reasoning is employed to arrive at conclusions in the final analysis.

3.6 Rationale for the Study

1. The rationales for the study are varied but interlinked.
2. The study will help to ascertain the level of compliance with the local environmental legislation (DoE standard) or ISO standard.
3. Developing countries are currently not benefiting from trade the way they should due to non-compliance to environmental standards adopted in industrialized countries like European Union (Mihyo, 2003). To participate in and benefit from international trade, developing countries have to get certified. However, industries in many developing countries still find it difficult to get certified (Mbohwa and Fukada, 2002).This study is aimed at ‘diagnosing’ the problem and making recommendations for future increase in compliance.
4. Results from the study would be very informative in increasing compliance with the standards, to cut cost, to improve the environment by way of reduction of emission and waste production for sustainable development.
5. Industries and establishments in Bangladesh do not have much reference information that they would find relevant for adopting EM practices in their operations as best as to international standards to make sustainable development and about benefits they would derive from it. The study would therefore serve as a

reference point to industries and policy makers trying to make sustainable development a priority in their activities and help industries of Bangladesh to get EM practice in their operations and relate it to the current state of environmental problems.

3.7 Limitations to the Study

1. Data for the study was collected arbitrarily from 34 manufacturing industries of different sectors of the country therefore making it difficult to draw a clear-cut generalization to all industries in Bangladesh.
2. The selection of companies was done purposively. Some of the companies declined to participate in the study and some, due to bureaucracy could not allow for the administration of the questionnaire directly to individuals responsible to the environment. The questionnaire was therefore left with Personnel Manager (PM) or Human Resource Manager (HRM). These might lead to bias in responses which ultimately could affect the study.
3. The study data are also limited by the knowledge and personal judgment of the participants as they were obtained through personal interviews and written responses. They thus had to rely on their memories on why and how some events occurred at their establishments. The anonymity of the companies was assured but some would as much as possible try to protect the image and reputation of their companies making it difficult to say whether the responses are what is actually happening in the establishments.
4. To determine links among motivations, methods and outcomes is beyond the scope of this study. Aggregate environmental performance was expected to be measured at a point in time. However, the respondents were not able to link specific management practice to comparative advantage enjoyed as a result of that practice. Despite this problem, the results provide a basis for understating corporate EMS and factors influencing companies in Bangladesh to adopt EM standards and advantages they are enjoying from it.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

The main objective of the study was to investigate the drivers and barriers of implementing EMS in manufacturing industries of Bangladesh. This study also investigated the current environmental management initiatives taken by manufacturing industries in Bangladesh and their motivation for adopting the system. The other objectives of the study were to seek problems encountered by companies getting certified to ISO 14001, assess the comparative advantages that industries with EMP are enjoying compared with what they were doing before and assess the level of compliance to local environmental regulations. This chapter contains results obtained from the field in respect to the above objectives. The results also try to validate the conceptual framework developed before the survey was carried out. It also includes the discussions with the existing literature. Based on the conceptual model a questionnaire survey was carried out and 34 manufacturing industries had been investigated.

4.2 Background and Location of the Industries

The study was carried out on different manufacturing industries of Bangladesh. Table 4.1 shows the distribution of the factories by location. From the table it is seen that 32% of the sample was taken from Gazipur district and 23% from Dhaka district. These figures do not indicate the proportional distribution of manufacturing industries in Bangladesh as the sample was taken conveniently. But it is obvious from Statistical Pocket Book (BBS, 2005) that major industrial development took place in larger urban areas like Dhaka, Chittagong, Gazipur etc.

Table 4.1: Sample Distribution of the factories by Location

Location	Frequency	Percent
Chittagong	5	14.7
Comilla	1	2.9
Dhaka	8	23.5
Gazipur	11	32.4
Kishoregonj	2	5.9
Mymensingh	1	2.9
Munshigonj	1	2.9
Narayangonj	5	14.7
Total	34	100.0

Table 4.2 shows the range of the number of employees of the surveyed manufacturing industries. The structure of the industries in Bangladesh as elsewhere is based on three structures; Small, Medium and Large. According to Industrial Policy 2010 of Government of Bangladesh, a manufacturing industry is classified based on the number of employees as a Small industry, if it employs 25-99 workers, a Medium Industry, if it employs 100-250 workers and a Large Industry, if the number of employees is more than 250. If on one criterion, a firm falls in to the 'small' category, while it falls into 'medium' category based on the other criterion, the firm will be deemed as in the 'medium' category. The same principle will be applicable to other classes of Industries also. In this survey, the Industries selected and interviewed were Medium to Large Industries as defined in industrial policy of Bangladesh.

Table 4.2: Number of Employees (Range) of the Surveyed Industries

Types of Industries	Number of Industries	Number of Employees (Range)
Cement	1	91
Chemical	1	400
Cotton Textile	4	300 - 4500
Detergent	1	160
Electrical, Electronics and Automobile	1	5583
Fertilizer	1	625
Food production and Processing	8	80 - 2000
Gases and Welding Electrode Manufacturing	1	170
Gases Manufacturing	1	130
Lead Acid Battery	1	687
NSD Powder and Bar	1	250
Oil and Gas	1	86
Paper	1	800
Pharmaceuticals	2	2500 - 3000
Plastic Products	4	60 - 2550
Power equipment	1	900
Ship dry docking	1	417
Shipyards	1	1000
Steel	2	200 - 600

Table 4.3 shows the categorical distribution of the samples in terms of final product types. From the table 4.3 it is found that there are total 19 categories of factories interviewed. Among the samples food production and processing, cotton and textile mills and plastic products were the major sectors and constitute 23%, 12% and 12% of the sample respectively. The rest of the industries are taken single unit as sample except pharmaceutical and steel industry. The reasons behind taking larger number of food production and processing industries as sample can be attributed to the fact that they showed much more interest than other industries to participate in the survey as they are confident that they truly care for the environment and the factories were easily accessible as well for the administration of the questionnaire.

However, the more reasonable rationale is that once upon a time food production and processing industries albeit were not considered as polluting as some other sectors like

textile, metal or leather industries, the food industries are now facing increasing pressure to ensure that their activities are environmentally sensitive. They have been responsible for air, water and soil pollution by emitting dust and unpleasant odour in the air, discharging liquid effluent with high organic content and generating large quantities of sludge and solid waste (European Commission 1997). Beverage companies generally produce 1.72 litres of waste water and 11.67 grams solid waste per 1 litre of drink production (www2.coca-cola.com, 2006). Some potato starch processing companies produce 100000 to 2500000 m³ of starch containing sludge annually. In the vegetable processing and preservation sectors up to one-third of the total quantity of raw materials may be rejected (UNEP, 1995).

Traditionally, the food processing industries has been a large water user. Hence, waste water is the primary area of concern for pollution prevention of the food or beverage industries. If the effluents from the food industry are contaminated with toxic metals, this can affect adversely on human health as either acute or chronic diseases. Live stocks, fish and agriculture production around the industry and its disposal site can also be hampered. Moreover, all the samples were selected purposively to carry out the survey successfully.

Table 4.3: Sample Distribution of factories in terms of final product types

Sector of Industries	Frequency	Percent
Power Equipment	1	2.9
Cement	1	2.9
Chemical	1	2.9
Cotton Textile	4	11.8
Detergent	1	2.9
Electrical, Electronics and Automobile	1	2.9
Fertilizer	1	2.9
Food production and Processing	8	23.5
Gases and Welding Electrode Manufacturing	1	2.9
Gases Manufacturing	1	2.9
Lead Acid Battery	1	2.9
NSD Powder and Bar	1	2.9
Oil and Gas	1	2.9
Paper	1	2.9
Pharmaceuticals	2	5.9
Plastic Products	4	11.8
Ship dry docking	1	2.9
Shipyards	1	2.9
Steel	2	5.9
Total	34	100.0

4.3 Current EM Practices (EMS) in Operation

The study investigated the current environmental EM initiatives by manufacturing industries of Bangladesh. It revealed that the industries use different forms of EMS. The following management systems are in operation in manufacturing industries of Bangladesh.

4.3.1 ISO 9000/9002 and other Management Systems

From the survey it was found that about 62.5% of the food processing industries applied a process control system - Hazard Analysis and Critical Control Points (HACCP) in their food production processes to prevent the hazards from occurring. Half of the industries (17, or 50% of the 34) have ISO 9000/9002 certification for their management system. When the industries were asked for the reasons for adopting this kind of management system, most of the respondents (70% of the 17) answered that ISO 9000 certification provided them comprehensive model for quality management system that could make them competitive. According to them, by implementing ISO 9000/90002, they became able to produce quality products through a more efficient and effective operation; could increase customer satisfaction and retention, enhance marketing, promote international trade, reduce waste and increase productivity. Employees' motivation, awareness and morale are also improved. About 53% of these factories that adopted ISO9000/9002 are export oriented local industries and 18% of the factories are Multi National Corporations (MNCs). A minority of the industries (10, or 29% of the 34 respondents) have safety management system and only four factories (12% of the overall) have ISO 22000 in their organizations. The above results indicate that Bangladesh has excellent evidence of implementing management system either localized or standard in the medium and large industries. Figure 4.1 shows the different types of EMS adopted by the factories in Bangladesh.

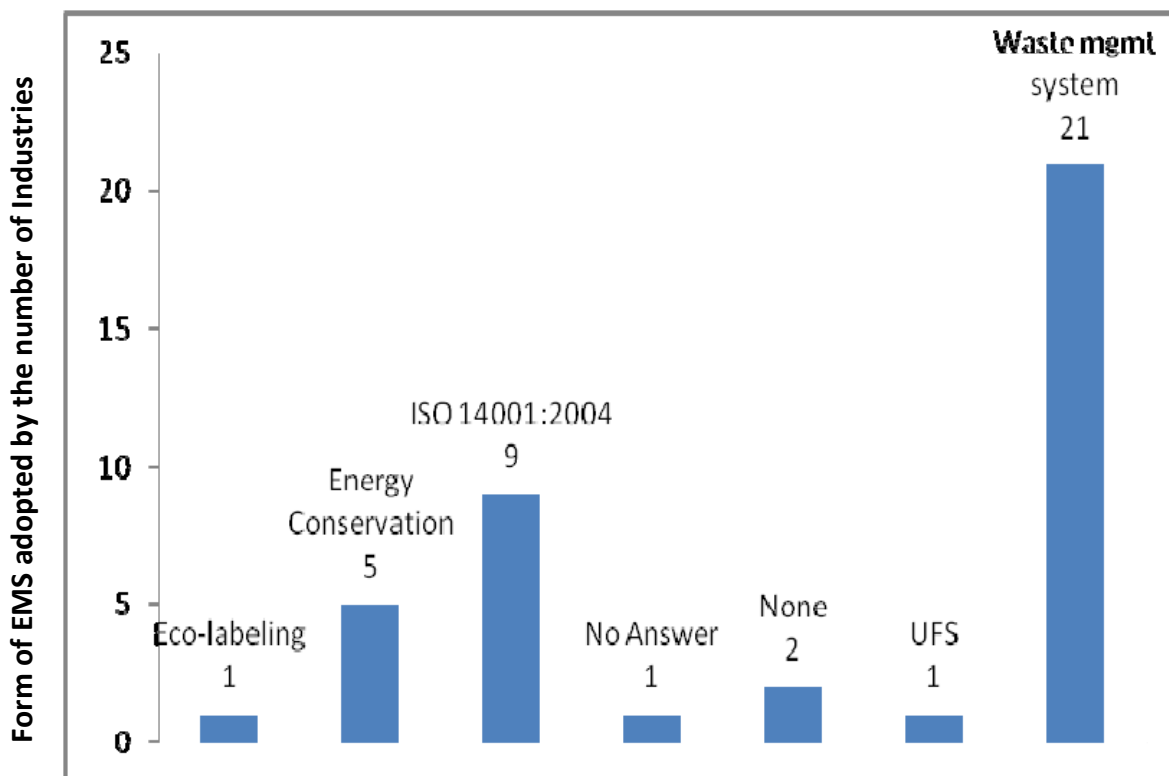


Figure 4.1: Environmental Management System (EMS) adopted by factories

4.3.2 ISO 14001 EMS

In this study it was explored that 9 companies out of 34 interviewed have EMS like ISO 14001 that means about 26% of the sample factories have ISO 14001 certification which indicates a very good environmental management practices in Bangladesh. The actual fact is that Bangladesh had only 2 (two) ISO 14001 certified companies in 2001 and 3 (three) certified companies in 2003. At present the number of ISO 14001 certified companies is 120 Reliable source shows (BSTI, interview) that ISO certification in Bangladesh has an increasing trend (Table 2.9). The respondents of these factories think that implementation of ISO 14001 EMS has given them international acceptability that might enhance export of their products. The superintendent of a company pointed out that it will help them to retain the ecology and biodiversity around their project site. Another respondent said that they are more conscious about process recovery, recycle and reuse. ISO 14001 certification will keep their reinsurance cost at a reasonable level. One of the respondents claims that they have now a reducing trend in raw material, natural resources and energy consumption, acceptance in global market. Another respondent pointed out that by adopting ISO 14001 EMS they could improve their employees' health and safety as well

as productivity that lead to decrease of sick days. Only three (33%) of the nine industries that were certified to ISO 14001 EMS claimed that they achieved full compliance to local legislation by reducing air, water and soil pollution; cost effectiveness in the long run, higher standard of working efficiency and overall environmental sustainability during their business growth. About 44% of the companies that adopted ISO 14001 EMS in their operations are Multi National Corporations (MNCs). As their parent organizations are outside the country, they have no alternative but to use the system to remain in the global market where competition and regulations exists to compel manufactures to be competitive. The rest of the companies (56%) are export oriented local industries.

4.3.3 Waste Management System

More than half of the industries (21, or 62% of the 34) have waste management system which indicates that greater number of manufacturing industries of Bangladesh is using EMS in their operations. Recent law and enforcement of pollution control regulations of the government and buyers demand have effect on waste management system. Government of Bangladesh renews environmental clearance certificate every year and it is mandatory for the waste generating factories to have waste management plan and system for their factories (ECR'97). Certainly there are demands from the buyers to have waste management system in the factories from which they buy or import products.

4.3.4 Eco-labelling

About 2.9% of the factories (only 1) were found to have developed eco-labelling as an environmental policy instrument along with other waste management system in their manufacturing units. They used eco-labelling as their business rationale for their product as it guarantees effectiveness which means the products are tested by independent laboratories for quality, are labelled with clear guidelines for safe, effective and efficient use and contain fewer hazardous chemicals. Moreover, the products have low environmental impacts through its life cycle-from manufacturing to disposal, have reduced health risks related to their use, including skin and eye irritation and no poisonous contents, ingredients that can not be carcinogenic.

4.3.5 Own Standard EMS

One respondent industry was found to have developed its own standard management system. This manufacturing factory has developed this by their in-house research and using better infrastructure facilities. This manufacturing factory has

worldwide recognition and established its ancillary factories worldwide to produce and market their products locally if possible within the country. The respondent organization claims that the standard EMS, they have developed is more useful and convenient to implement effectively in their specific cases of operations than any other international standard EMS. This statement substantiates the study of Kolk (2000) that some MNCs claim that they have much more sophisticated system in place other than the weak ISO 14001 EMS as such there is no need to certify to ISO 14001.

4.3.6 Energy Conservation

The field survey also reveals that a minority of the sample industries (5, or 15% of the 34 companies) adopted measures for energy conservation. Their motivation for adopting measures for energy conservation is perhaps increased price of energy or energy crisis within the country or motivation for the venture of climate change mitigation. These industries have taken up various energy saving projects. As for example it can be mentioned that while surveying one of these factories, it was seen that LED lights were attached on the machines instead of putting up an extra overhead light bulb. The environmental manager of the factory said, "We are using boiler economizer as well as different forms of steam energy while dying to reduce fuel consumption".

Nine percent of the manufacturing industries interviewed do not have either any management system or did not answer the question.

4.4 Motivation for the Development of EMS

The rationales for the development of EMS can be internal and external as discussed in the literature. The study therefore seeks to ascertain the reasons why industries try to use EMS in their operations. The drivers that motivated manufacturing industries of Bangladesh for adopting EMS are different in categories.

4.4.1 International Acceptance

The motivation for the development of EMS within the factories is mostly for the international acceptance and from the survey it was found that the majority of the factories (24, or 71% of the 34) adopted EMS for international acceptance. And most of them (20, or 83% of the 24) are local industries. This is because most consumers now demand environmental loyalty of the factories before they purchase its products. Environment friendly goods are being sought by the consumers and they are willing to pay more for that

product in the developed countries. Now a days, many international buyers actually care about the environment and the workers. They have a look at the entire factory, analyse the way it runs before signing a deal with the factory. It was inferred from the statements of the respondents that though they were a tad more expensive compared to others i.e. competitors; never the less, at the end of the day, they won many contracts because of their super disposal system and the way they treated their workers. Without giving proper attention to the environment and implementing an effective EMS in the manufacturing units, the industries will not survive in the business longer. This inference is substantiated by the fact that half of the factories (12, or 50% of the 24) also ticked removing of the international trade barrier as an option for motivation to implement EMSs in their operations. From the secondary source of data it can be observed that more than half of the respondents (11, or 55% of the 20 local industries) have already been exporting their products to some extent.

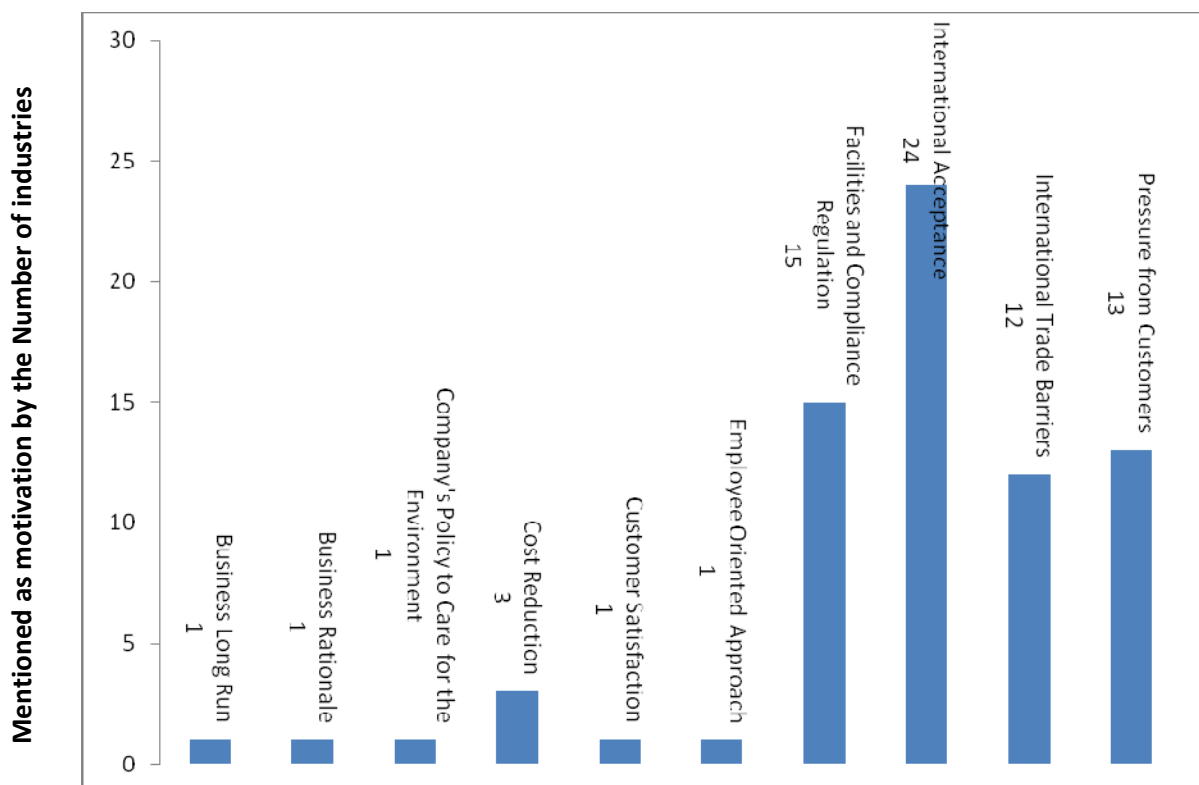


Figure 4.2: Frequency distribution of different types of driving forces for implementing EMS in Bangladesh

4.4.2 Compliance to Regulation

Compliance to regulation played next vital role for the implementation of EMS. Survey showed that almost half of the factories (15, or 44% of the sample industries) implemented EMS for this issue along with other issues. The literature shows that environmental initiative taken by organizations is driven primarily by external forces, such as regulatory pressures. This result is almost similar to the study carried out by Porter and Van der Linde (1995b) that government regulations may serve in practice as a stimulus to both economic growth and cleaner production and might increase resource productivity in response to both regulatory and market pressures.

4.4.3 Business or Social Commitment

From the survey it was found that some (only 3 out of 8) food production and processing industries claim that though their activities have less negative environmental impacts on the environment, they have focused on the legal compliance of their factories thereby, they are voluntarily reaching towards the goal of EMS implementation as a part of their business commitment and policy. Fewer also thought controlling the environmental pollution as their social commitment and responsibilities. This category includes a textile, a pharmaceutical and two plastic industries. This is a good indication about the education and awareness level among the companies towards conserving the environment and energy. These results also substantiate the study of Kolk (2000) that some firms with less environmental risks used to focus on compliance to regulations but as EM developed, firms started to move beyond mere compliance.

4.4.4 Other Drivers of EMS

From the field survey it was found that the driving mechanisms for adopting EMS in manufacturing industries are different in categories. These are business rationale (3%), company's policy to care for the environment (3%) and pressures from customers (38%). The study finds that about 9% of the sample industries are motivated for implementing EMS for their production cost reduction. The study also reveals that there is no social or community force that compels industries to adopt the environmental management practises in their operations.

4.5 Benefits Perception from EMS

Prevention of pollution, which is the idea underlying the concept of an environmental management system generates mechanisms aimed at minimizing material, resources and energy consumption. It is difficult to identify the benefits which directly arise from environmental management system implementation as well as the benefits which indirectly spring from maintaining the system (MATUSZAK-FLEJSZMAN A. 2009). However; industries, of course, hope to derive comparative advantages by implementing an EMS in their operations. The current study seeks to know if manufacturing industries of Bangladesh have such awareness of the benefits of an EMS adoption. The respondents gave various responses in this regard that are in line with what has been reviewed in the literature that an EMS has the tendency of leading to advantages to companies and the environment.

4.5.1 Success Rate of the EMS

About 70% of the sample industries with standard ISO 14001 EMS certification or other localized EMS have rated the system as successful in most of the cases. This success in their opinion is due to experience with other management systems, management commitment and involvement, advanced planning and trained workers and staffs. Other 20% of the respondents could not tell about the success rate while the rest 10% have rated these systems as failed to contribute to the company's success because of lack of experience, planning and management commitment and involvement.

4.5.2 Customers' Satisfaction

From the survey it was found that most of the companies' representatives think that by implementing EMS in their factories they might compete with quality and service and grow their business sustainable. They are also thinking that by implementing EMS they might achieve customer satisfaction as well.

4.5.3 Cost Reduction

During past few years, a number of plastic industries adopted EMS and saved significant amount of their production cost annually. Study shows that many of these manufacturing industries saved 30% of its water consumption, reduced 20% chemical consumption, reduced 30% Green House Gas emission (Third Meeting of the Regional 3R

Forum in Asia, 2011). However, from the current study it was found that by adopting EMS in their operations almost all the plastic industries (4 plastic companies) interviewed have reduced their cost as a result of decreasing energy consumption and the volume of waste generation and providing due attention to proper waste management of the factories. In addition to this, 23% of the rest of the respondent organizations (30 respondents) mentioned that they have saved significant amount of their cost annually as a result of streamlining the efficiency of the running processes, designing products and services so as to limit natural resources consumption and at the same time maintain quality, improving efficiency of the infrastructure used as well as reducing cost of treatment of low volume of waste and fines and legal fees.

4.5.4 Increase of Overall Performance

From the survey it was explored that the companies have no critical assessment about their overall performance in terms of creating comparative advantages. But company's perception is good after implementing EMS and 85% of the respondents admitted that this indicator has increased their performance in most of the cases. These helped them to penetrate into other market, increase their business, reduce cost, reduce waste generation and minimize legal fines and fees. The environmental manager of a certified factory stated, "When we initially set up our factory, we decided that we would only start the dying processes after our effluent treatment plant (ETP) was ready as a part of EMS implementation in our factory. Currently the waste from our industry goes a series of chemical and biological reactions before getting discharged". A number of fish aquariums, right next to the ETP, set up with the treated effluent were noticed. "At present, the effluent does not affect the aquatic life" he added. According to him, the huge investment in the factory's waste management system has given them many rewards. Another responded pointed out "We have however reduced emission of dust particles to air as a result of the adoption of EMS. Waste has also been minimised and we now practice recycling of both water and heat all leading to the reduction of cost." "We are now in harmony with our community."

4.5.5 Increase of Workers' Competence

The survey also revealed that about 94% of the respondents think that competence of their staff has increased and attitude of staffs towards environmental work has changed (88%) since the implementation of the EMS. Awareness about safety issues, behavioural change and caring for environment have significantly increased among the staffs because of training acquired by the staffs and in-house awareness raising campaign in factories.

4.5.6 Other Benefits

The survey showed that 44% of the respondents think that EMS implementation has effected changes in the product while another 44% of them do not think so. Therefore, there is possibility of changing product or not equally after implementation of the EMS. The survey also showed that about 41% of the respondents think that ISO 14001 certification or other EMS is tickets to market access to the industrialized countries while 38% respondents do not think so and other 21% of them have no idea about this issue.

4.6 Barriers of Achieving EMS

A major objective of this study is to find out impediments organizations are facing for obtaining standard environmental management system or localized environmental management system in their operations. Most of the companies gave multiple responses. So no single reason is responsible for the barriers.

4.6.1 High Investment and Maintenance Cost

Almost one third of the respondents (12, or 35% of the 34 factories) think that establishing EMS requires high cost. "This requires a lot of investment. We need to spend about Taka 10 crore to implement EMS. Almost as much as some people invest for the entire factory" said one of the respondents. Moreover, cost of operating or maintaining EMS is also very expensive. Another respondent said, "It costs around taka 60-70 thousand per day only to run the waste disposal system, so many industries do not bother to purify the effluent every day."

4.6.2 Lack of Government Incentives

Many of the respondent organizations are complaining that there is lack of government incentives and 29% of the industries interviewed belonged to that group. But

the fact is that government has established incentives for the investors to establish EMS. There are several ways by which government can help to overcome the barriers and actively encourage industrial waste minimization activities. These include the provision of technical assistance programs, the creation and enforcement of pollution control regulations, the dissemination of information about waste minimization programs and opportunities, the establishment of financial incentives and the foundation of award programs recognizing significant achievements in waste minimization (MOEF, 2005).

4.6.3 Management Ignorance of Regulations, its Existences and Other Impediments

Other responses to the reason why industries have not yet implemented EMS include management ignorance of its existence (12, or 35% of the 34) and ignorance of government regulations (13, or 38% of the total respondents). A respondent pointed out that the process of obtaining ISO 14001EMS certification is a complex process and two of the respondents thought that the process is time consuming. But most of the interviewees opined that awareness raising campaign should be wide spread both from the government and civil society for establishing EMS. Figure 4.3 shows the perception of the respondents about the impediments of getting ISO 14001 EMS or other standard EMS.

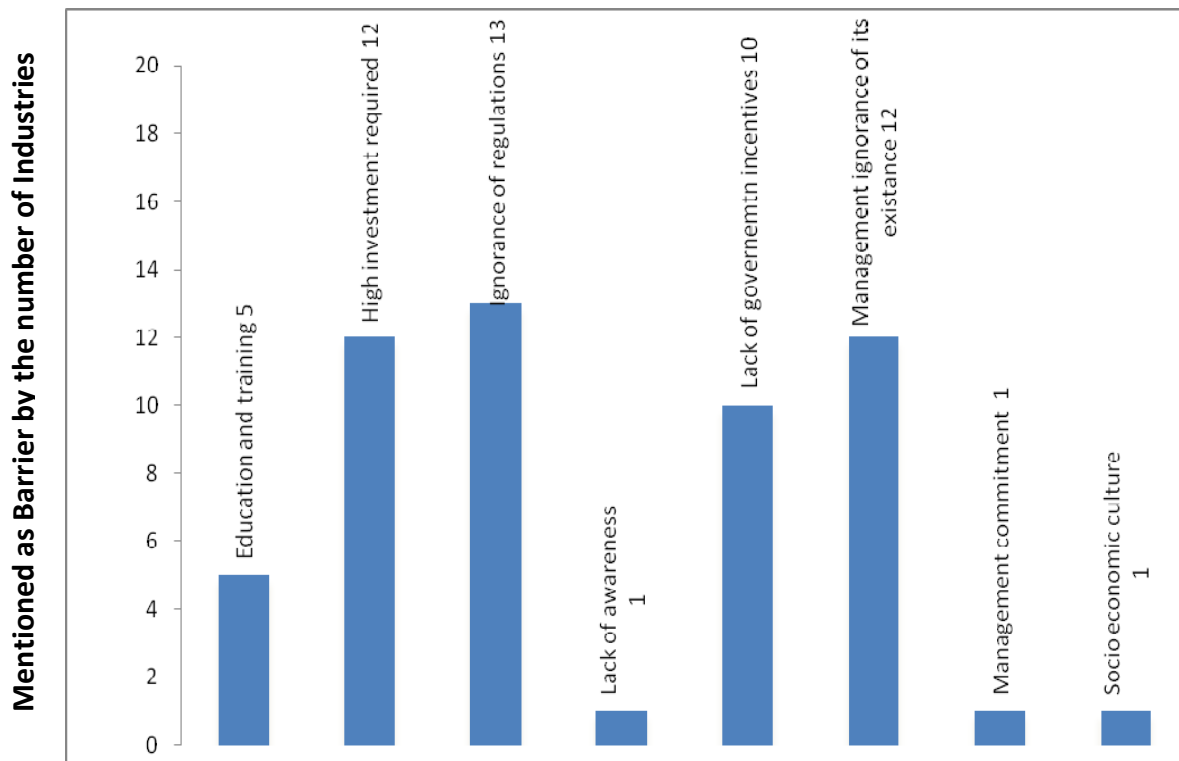


Figure 4.3: Barriers of EMS Implementation

Perception regarding the standard EMS such as ISO certification is mixed. Figure 4.4 shows perception of the management regarding obtaining ISO certification.

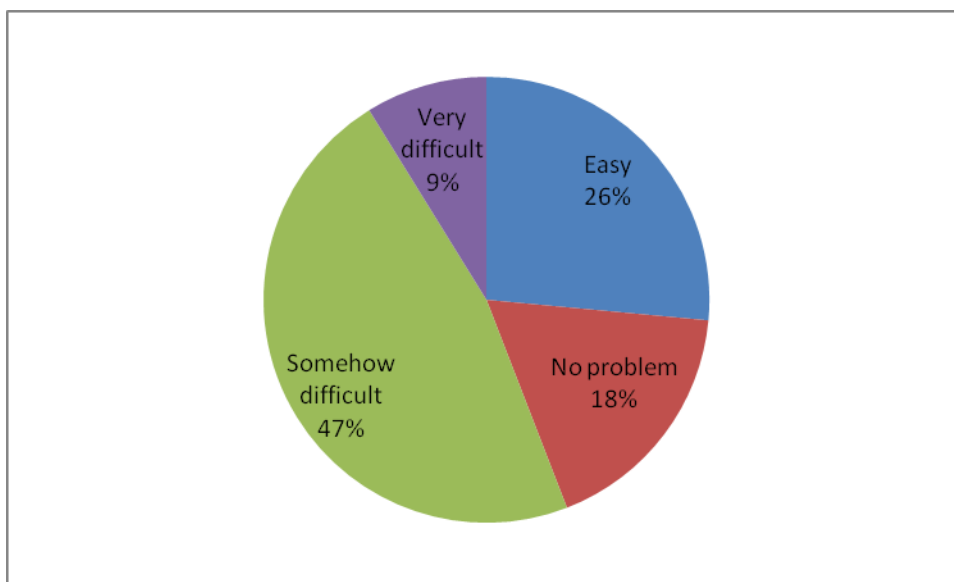


Fig 4.4: Perception about obtaining EMS certification

4.7 Compliance to Local Legislation

The survey revealed that all of the respondents had taken environmental issues as important in their operations within their factories. This indicates that entrepreneurs are concerned about the environmental issues. One of the respondents said, "Business should not become big for the sake of becoming big - It should incorporate environmental protection, compliance and ethics". But there are problems despite their willingness. While surveying the industries, it has been realised that some of the companies do not have personnel responsible to the environment that is why they depend on other staffs lacking adequate environmental knowledge and knowledge of present environmental rules and regulations to understand environmental issues. Moreover, they do not have any zeal to know how and where they can get support for taking environmental management initiatives in their operations and how the EMS already implemented in their enterprises benefiting them in terms of saving utility bills and waste reduction, because they find EMS of too much administrative burden they cannot afford. A minority of the respondents (7, or 21% of the total industries surveyed) claimed that they have EMS manager for the implementation and maintenance of Environmental Management System (EMS) successfully in their operations. What is very disappointing is that four of the seven industries (57%) are multinational corporations operating their business here in Bangladesh. Table 4.4 shows the position of the person responsible for the EMS implementation in their industries.

Table 4.4: List of Responsible Officers for the EMS implementation in their industries

Position of EMS Implementation Officer	Number of Industries	Percent
Directors	03	8.8
Chief Executive Officer (CEO)	05	14.7
General Manager (GM), Operation	03	8.8
Assistant General Manager (AGM), Operation	01	2.9
Factory Manager	01	2.9
Human Resource Manager	01	2.9
Management Representative	01	2.9
Environmental Manager	04	11.8
Safety, Health & Environment Co-ordinator	03	8.8
Quality Manager	05	14.7
Production Manager	05	14.7
None	02	5.9
Total	34	100

However if the responsible officers are well trained and well informed there might be different scenario. Qualified environmental managers would be in a better position to use the procedures involved in EMS.

Most of the interviewees were mid level to high level managements. Despite their positions they merely have concept about rules and regulations and other policies related to environmental issues in Bangladesh. Nevertheless, what is interesting is that most of the industries easily identified some impacts of their activities on the environment in the form of discharge to water, emission to air and waste products. The environmental managers of some industries interviewed however lamented on the type of technology at their disposal when compared to that of industrialized countries and considered it as a major hindrance to adopting good EM. However, one respondent said confidently, "we have installed European standard ETP so that discharged water parameter meet DoE standard; installed standard chimney for boiler and generator according to DoE standard; installed Garber system to reduce solid waste; installed high technology based burner at our boiler to reduce air emission".

The implementation of an EMS does not always guarantee compliance to regulation and lead to sustainable development but indeed shows industry's commitment to comply with local legislation. The DoE recently fined a number of factories for disposing toxic wastes into the rivers. DoE has so far accused 1152 industries for penalties amounting 109.90 crore taka from July 2010 to May 2013. So far, 78.81 crore taka has been recovered from those accusation.

Though it is mandatory for a factory to build an ETP or establish an emission control system in order to be permitted to start up its operation and the number of factories that contain ETPs or EMPs is not too small, however, we do not know for sure if they are running them every day since it is a very expensive procedure. The enforcement team of the DoE sometimes finds it difficult to monitor the waste disposal system of the factories and to fine industries polluting the environment in the country.

Bangladesh has been attracting industries from developed countries by establishing a number of export processing zones (EPZs) to provide employment, income and revenue to attain its economic development. At the same time the industries also seek to increase

profit by minimising cost. As EMS is seen by them as increased cost to their operations they pollute the environment. So they have to think how environmental friendliness and profitability can be made perfectly compatible. In this connection, it can be mention that the ECA '95 and ECR '97 have encouraged and mandated the polluters not to pollute the environment. The following enforcement actions are generally taken in response to violations of the ECA '95 and ECR '97 including violation of any condition to a clearance: Warning; Direction; Closure, Prohibition or Control Direction; Direction to disconnect Services; Prosecution; Civil action to recover damages (MOEF, 2008).

CHAPTER 5

CONCLUSIONS AND SUGGESTIONS

5.1 Conclusion

The main objective of the study was to investigate the drivers and barriers of implementing EMS in manufacturing industries of Bangladesh. This study also investigated the current environmental management initiatives taken by manufacturing industries in Bangladesh. The conclusions of the study are stated below:

1. Implementation of EMS in Bangladesh is complex in nature. Manufacturing industries in Bangladesh have developed some form of environmental management practices like pollution control, waste management, energy conservation, etc. in their operations. About 50% of the industries have ISO 9000/9002 certification for their management system. Most of the food processing industries (62.5%) have HACCP certification. 26% of the sample industries have ISO 14001 certification. 31 industries out of 34 have some sort of environmental management system. 21 factories have their own waste management system.
2. Major drivers of implementing EMS were business rationale (3%), cost reduction (9%), pressure from customers (38%), compliance to local legislation (44%) and international acceptance (71%).
3. Barriers of implementation of EMS in the manufacturing industries of Bangladesh are complexity in the process (3%), lack of awareness (3%), lack of education and training (15%), lack of government incentives (29%), high investment cost (35%), management ignorance of its existence (35%) and ignorance of government regulations (38%).

4. Large and medium industries in Bangladesh established EMS in their manufacturing units for international acceptance and removing trade barriers but from the study it was realized that manufacturers are still reluctant about the necessity of implementation of EMS in Bangladesh.

5.2 Suggestions for Future Studies

1. In the current study the questionnaire designed were mostly of nominal type. For future study, questionnaire can be designed with dichotomous variables or scoring system can be employed to find out the dependencies among/ between variables.
2. In the current study, samples were not homogeneous or categorized. For future study, to make the results statistically more justifiable samples can be categorically framed and homogeneity can be maintained.

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QUESTIONNAIRE

Present Situation of Environmental Management Practices in Different Manufacturing Industries of Bangladesh

Please the questionnaire is intended for academic purpose only. Kindly be frank in answering the questions as possible. The company's name would not be displayed in the final report. Thank you.

A. BACKGROUND

1. What is the location of your industry?
2. How many employees do you have?
3. Which type of industry by sector is your establishment?

a. Food Production/Processing []	b. Beverages/Candies []
c. Cotton/Textiles []	d. Plastic Products []
e. Pharmaceutical []	f. Other..... [Please indicate]
4. Please, what is your position in the establishment?
5. How long have you been employed in this establishment?

B. EMS IMPLEMENTATION

6. Which management system have you established in your organization?

a. ISO 9000/9002 []	b. Safety and Management []
c. EMAS regulation []	d. Others..... []
e. None []	

7. Which EMS have you developed in your establishment?
- | | |
|------------------------------------|----------------------------|
| a. ISO14001 [] | b. Eco-labelling [] |
| c. Waste Management System [] | d. Energy conservation [] |
| e. Life cycle assessment [LCA] [] | f. Others..... [] |
| g. None [] | |
8. What is the most important rationale for its implementation?
- | | |
|---------------------------------|--|
| a. International acceptance [] | b. Removing international trade barriers [] |
| c. Pressure from customers [] | d. Facilitates compliance to regulations [] |
| e. Can't tell [] | |
| f. Others..... [] | |
9. Who is responsible for the EMS implementation in the establishment?
- | | |
|------------------------------|---------------------------|
| a. CEO [] | b. Quality Manager [] |
| c. Environmental manager [] | d. Production Manager [] |
| e. Board of Directors [] | |
| f. Others..... [] | |
10. What is the major driver of the implementation of the EMS in your industry?
- | | |
|------------------------------|--------------------|
| a. Board of directors [] | b. Employees [] |
| c. Government regulation [] | d. Customers [] |
| e. Consultants [] | f. Others..... [] |
| g. Can't tell [] | |

C. ADVANTAGES

11. How would you rate the success of the EMS implemented in your industry?
- | | | |
|---------------|------------------|-------------------|
| a. Failed [] | b. Succeeded [] | c. Can't Tell [] |
|---------------|------------------|-------------------|
12. What are the reasons for failure of the EMS in your establishment?
- | | |
|--|-------------------------|
| a. Lack of experience with other management system [] | |
| b. Lack of personnel training [] | c. Lack of planning [] |
| d. High cost of EMS implementation [] | |
| e. Inadequate management involvement [] | f. Can't tell [] |
| g. Others..... [] | |

13. What are the reasons for success of the EMS in your industry?
- a. Experience with other management systems []
 - b. Management commitment and Involvement []
 - c. Training workers acquired []
 - d. Advance Planning []
 - e. Can't tell []
 - f. Others[]
14. What are the benefits you derived or hope to derive from EMS implementation?
- a.
 - b.
15. How has EMS impacted your company's overall performance in terms of creating comparative advantage?
- a. Decreased []
 - b. Slightly decreased []
 - c. Increased []
 - d. Slightly increases []
 - e. No change []
 - f. Can't tell []
16. If it has decreased, what are the causes?
- a. Government legislation []
 - b. Inadequate management awareness []
 - c. Low market access []
 - d. Inadequate customer awareness []
 - e. Can't Tell []
 - f. Others..... []
17. If it has increased, what has brought this increment?
- a. Penetration of other markets []
 - b. Increased market share []
 - c. Cost reduction []
 - d. Waste reduction []
 - e. Reduction of fines and legal fees []
 - f. Can't tell []
 - g. Other..... []
18. Has the competence of your company staff increased since EMS implementation?
- a. Yes []
 - b. No []
19. Has the attitude of the staff towards environmental work changed during the process?
- a. Yes []
 - b. No []
20. If yes, how?

21. If no, why?

22. Have you noticed changes in the products after EMS implementation?

a. Yes []

b. No []

D. BARRIERS

23. What kind of impediments/barriers have you met in your process of EMS implementation?

a. High investment required []

b. Management ignorance of its existence []

c. Long time of certification []

d. Lack of government incentives []

e. Ignorance of regulations []

f. Can't tell []

g. Other..... []

24. What is your perception regarding the difficulty of obtaining EMS in your establishment?

a. Very easy []

b. Easy []

c. No problem []

d. Somehow difficult []

e. Very difficult []

E. COMPLIANCE TO LOCAL LEGISLATION

25. Has your company taken environmental issues as important in its operation?

a. Yes []

b. No []

26. Would you say your organization's activity has an impact on the environment?

a. Yes []

b. No []

c. Can't Tell []

27. Are these impacts positive or negative?

a. Positive []

b. Negative []

c. Can't tell []

28. Which environmental regulations have you been complying with?

a.[]

b.[]

29. Kindly give suggestions to improve EMS implementation in Bangladesh.

a..... []

b..... []

THANK YOU VERY MUCH FOR YOUR SUPPORT

Annexure II

QUESTIONNAIRE

Present Situation of Environmental Management Practices in Different Manufacturing
Industries of Bangladesh

Please the questionnaire is intended for academic purpose only. Kindly be frank in answering the questions as possible. The company's name would not be displayed in the final report. Thank you.

A. BACKGROUND

1. What is the location of your establishment?
Chittagong, Anowara.
2. How many employees do you have?
625
3. Which type of industry by sector is your establishment?

a. Food Production/Processing []	b. Beverages/Candies []
c. Cotton/Textiles []	d. Plastic Products []
e. Pharmaceutical []	f. Other... <u>Facilities</u> []
4. Please, what is your position in the establishment?

a. CEO []	b. Environmental manager []
c. Quality manager []	d. Other... <u>Shift Manager</u> []
5. How long have you been employed in this establishment?

a. Less than a year []	b. > one but < two years []
c. > two but < five []	d. > five but < 10 []
e. > ten []	f. Other..... []

B. EMS IMPLEMENTATION

6. Which management system have you established in your organization?
- a. ISO 9000/9002
 - b. Safety and Management
 - c. EMAS regulation
 - d. None
 - e. Others.....
7. Which EMS have you developed in your establishment?
- a. ISO 14001
 - b. Eco-labeling
 - c. Waste Management System
 - d. Energy conservation
 - e. Life cycle assessment [LCA]
 - f. Other.....
 - g. None
8. What is the most important rationale for its implementation?
- a. International acceptance
 - b. International trade barriers
 - c. Facilitates compliance/regulations
 - d. Pressure from customers
 - e. Cost Reduction
 - f. Can't tell
 - g. Other.....
9. Who is responsible for the EMS implementation in the establishment?
- a. CEO
 - b. Quality manager
 - c. Environmental manager
 - d. Production manager
 - e. Board of directors
 - f. Other.....
10. What is the major driver of the implementation of the EMS in your establishment?
- a. Board of directors
 - b. Employees
 - c. Government regulation
 - d. Customers
 - e. Consultants
 - f. Other.....
 - g. Can't tell

C. ADVANTAGES

11. How would you rate the success of the standard?
- a. Failed
 - b. Succeeded
 - c. Can't Tell
12. What are the reasons for failure of the EMS in your company?
- a. Lack of experience
 - b. Lack of personnel training
 - c. High cost of certification
 - d. Lack of planning
 - e. Inadequate management involvement
 - f. Can't tell
 - g. Others.....

13. What are the reasons for success of the EMS in your company?
 a. Experience with other management systems []
~~b. Management commitment and Involvement []~~
 c. Training workers acquired [] d. Advance Planning []
 e. Can't tell [] f. Others []
14. What are the benefits you derived or hope to derive from EMS implementation?
 a. We are more conscious on process recovery, recycle and reuse.
 b. Rein. insurance cost at reasonable level.
15. How has EMS impacted your company's overall performance in terms of creating comparative advantage?
 a. Decreased [] b. Slightly decreased []
 c. No change [] d. Slightly increases []
 e. Increased [] f. Can't tell []
16. If it has decreased, what are the causes?
 a. Government legislation [] b. Inadequate management awareness []
 c. Low market access [] d. Inadequate customer awareness []
 e. Can't Tell [] f. Other..... []
17. If it has increased, what has brought this increment?
 a. Penetration of other markets [] b. Increased market share []
 c. Cost reduction [] d. Waste reduction []
 e. Reduction of fines and legal fees [] f. Can't tell []
 g. Other..... []
18. Has the competence in your company staff in EMS increased since implementation?
 a. Yes b. No []
19. Has the attitude of the staff towards environmental work changed during the process?
 a. Yes b. No []
20. If yes, how? Checking of various Environmental Parameter increased
Negative attitude v Environmental regulation reduced
about
21. If no, why?
22. Did you effect changes in the products after implementation?
 a. Yes [] b. No

D. BARRIERS

23. What kind of impediments/barriers have you met in your process of EMS implementation?
- a. High investment required [] b. Management ignorance of its existence []
 c. Long time of certification [] d. Lack of government incentives []
 e. Ignorance of regulations [] f. Can't tell []
 g. Other... *indifferent* []
24. What is your perception regarding the difficulty of obtaining ISO 14001 certification?
- a. Very easy [] b. Easy [] c. No problem []
~~d.~~ Somewhat difficult [] e. Very difficult []

E. COMPLIANCE TO LOCAL LEGISLATION

25. Has your company taken environmental issues as important in its operation?
- a. Yes [] b. No []
26. Would you say your organization's activity has an impact on the environment?
- a. Yes [] b. No [] c. Can't Tell []
27. Are these impacts positive or negative?
- a. Positive [] b. Negative [] c. Can't tell []
28. Which environmental regulations have you been complying with?
- a. []
 b. []
29. Kindly give suggestions to improve EMS certification in Bangladesh
- a. *Attitude* []
 b. *Cost & Conscious* []

THANK YOU VERY MUCH FOR YOUR SUPPORT

Annexure III

QUESTIONNAIRE

Present Situation of Environmental Management Practices in Different Manufacturing
Industries of Bangladesh

Please the questionnaire is intended for academic purpose only. Kindly be frank in answering the questions as possible. The company's name would not be displayed in the final report. Thank you.

A. BACKGROUND

1. What is the location of your establishment?
Gazipur
2. How many employees do you have?
400
3. Which type of industry by sector is your establishment?

a. Food Production/Processing []	b. Beverages/Candies []
c. Cotton/Textiles []	d. Plastic Products []
e. Pharmaceutical []	f. Other... <u>Chemical</u> []
4. Please, what is your position in the establishment?

a. CEO []	b. Environmental manager []
c. Quality manager []	d. Other... <u>Manager (Sales)</u> []

5. How long have you been employed in this establishment?
- | | |
|---|------------------------------|
| a. Less than a year [] | b. > one but < two years [] |
| <input checked="" type="checkbox"/> c. > two but < five [] | d. > five but < 10 [] |
| e. > ten [] | f. Other..... [] |

B. EMS IMPLEMENTATION

6. Which management system have you established in your organization?
- | | |
|--|--------------------------|
| <input checked="" type="checkbox"/> a. ISO 9000/9002 [] | b. Safety and Management |
| c. EMAS regulation [] | d. None [] |
| e. Others..... [] | |
7. Which EMS have you developed in your establishment?
- | | |
|--|----------------------------|
| a. ISO 14001 [] | b. Eco-labeling [] |
| <input checked="" type="checkbox"/> c. Waste Management System [] | d. Energy conservation [] |
| e. Life cycle assessment [LCA] [] | f. Other..... |
| g. None [] | |
8. What is the most important rationale for its implementation?
- | | |
|---|--------------------------------|
| <input checked="" type="checkbox"/> a. International acceptance [] | b. International trade barrier |
| c. Facilitates compliance/regulations [] | d. Pressure from customers |
| e. Cost Reduction [] | f. Can't tell [] |
| g. Other..... [] | |
9. Who is responsible for the EMS implementation in the establishment?
- | | |
|--|---------------------------|
| <input checked="" type="checkbox"/> a. CEO [] | b. Quality manager [] |
| c. Environmental manager [] | d. Production manager [] |
| e. Board of directors [] | f. Other..... |
10. What is the major driver of the implementation of the EMS in your establishment?
- | | |
|---|------------------|
| <input checked="" type="checkbox"/> a. Board of directors [] | b. Employees [] |
| c. Government regulation [] | d. Customers [] |
| e. Consultants [] | f. Other..... |
| g. Can't tell [] | |

C. ADVANTAGES

11. How would you rate the success of the standard?
- | | | |
|---------------|--|-------------------|
| a. Failed [] | <input checked="" type="checkbox"/> b. Succeeded [] | c. Can't Tell [] |
|---------------|--|-------------------|

12. What are the reasons for failure of the EMS in your company?
a. Lack of experience [] b. Lack of personnel training []
c. High cost of certification [] d. Lack of planning []
e. Inadequate management involvement [] f. Can't tell []
g. Others..... []
13. What are the reasons for success of the EMS in your company?
a. Experience with other management systems []
✓ b. Management commitment and Involvement []
c. Training workers acquired [] d. Advance Planning []
e. Can't tell [] f. Others []
14. What are the benefits you derived or hope to derive from EMS implementation?
a. *International... Acceptance*.....
b. *Customers... satisfaction*.....
15. How has EMS impacted your company's overall performance in terms of creating comparative advantage?
a. Decreased [] b. Slightly decreased []
c. No change [] d. Slightly increases []
✓ e. Increased [] f. Can't tell []
16. If it has decreased, what are the causes?
a. Government legislation [] b. Inadequate management awareness []
c. Low market access [] d. Inadequate customer awareness []
e. Can't Tell [] f. Other..... []
17. If it has increased, what has brought this increment?
a. Penetration of other markets [] **✓** b. Increased market share []
c. Cost reduction [] d. Waste reduction []
e. Reduction of fines and legal fees [] f. Can't tell []
g. Other..... []
18. Has the competence in your company staff in EMS increased since implementation?
✓ a. Yes [] b. No []
19. Has the attitude of the staff towards environmental work changed during the process?
✓ a. Yes [] b. No []
20. If yes, how? *...sincerity, Acknowledgement.....*

21. If no, why?
22. Did you effect changes in the products after implementation?
 Yes [] b. No []

D. BARRIERS

23. What kind of impediments/barriers have you met in your process of EMS implementation?
- | | |
|-----------------------------------|---|
| a. High investment required [] | b. Management ignorance of its existence [] |
| c. Long time of certification [] | <input checked="" type="checkbox"/> Lack of government incentives [] |
| e. Ignorance of regulations [] | f. Can't tell [] |
| g. Other..... [] | |
24. What is your perception regarding the difficulty of obtaining ISO 14001 certification?
- | | | |
|--------------------------|-----------------------|--|
| a. Very easy [] | b. Easy [] | <input checked="" type="checkbox"/> No problem [] |
| d. Somehow difficult [] | e. Very difficult [] | |

E. COMPLIANCE TO LOCAL LEGISLATION

25. Has your company taken environmental issues as important in its operation?
 Yes [] b. No []
26. Would you say your organization's activity has an impact on the environment?
 Yes [] b. No [] c. Can't Tell []
27. Are these impacts positive or negative?
 Positive [] b. Negative [] c. Can't tell []
28. Which environmental regulations have you been complying with?
 a. []
 b. []
29. Kindly give suggestions to improve EMS certification in Bangladesh
 a..... Government Incentives..... []
 b..... More advertisement..... []

THANK YOU VERY MUCH FOR YOUR SUPPORT

B. EMS IMPLEMENTATION

6. Which management system have you established in your organization?
- | | |
|--|------------------------------|
| a. ISO 9000/9002 [] | b. Safety and Management [] |
| c. EMAS regulation [] | d. None [] |
| <input checked="" type="checkbox"/> e. Others.. <i>9110 & 2001</i> [] | |
7. Which EMS have you developed in your establishment?
- | | |
|--|----------------------------|
| a. ISO 14001 [] | b. Eco-labeling [] |
| <input checked="" type="checkbox"/> c. Waste Management System [] | d. Energy conservation [] |
| e. Life cycle assessment [LCA] [] | f. Other..... [] |
| g. None [] | |
8. What is the most important rationale for its implementation?
- | | |
|---|-------------------------------------|
| <input checked="" type="checkbox"/> a. International acceptance [] | b. International trade barriers [] |
| <input checked="" type="checkbox"/> c. Facilitates compliance/regulations [] | d. Pressure from customers [] |
| e. Cost Reduction [] | f. Can't tell [] |
| g. Other..... [] | |
9. Who is responsible for the EMS implementation in the establishment?
- | | |
|------------------------------|---|
| a. CEO [] | b. Quality manager [] |
| c. Environmental manager [] | d. Production manager [] |
| e. Board of directors [] | <input checked="" type="checkbox"/> f. Other.. <i>Head of... S.H.F.R.</i> [] |
10. What is the major driver of the implementation of the EMS in your establishment?
- | | |
|---|-------------------|
| <input checked="" type="checkbox"/> a. Board of directors [] | b. Employees [] |
| c. Government regulation [] | d. Customers [] |
| e. Consultants [] | f. Other..... [] |
| g. Can't tell [] | |

C. ADVANTAGES

11. How would you rate the success of the standard?
- | | | |
|---------------|--|-------------------|
| a. Failed [] | b. Succeeded <input checked="" type="checkbox"/> | c. Can't Tell [] |
|---------------|--|-------------------|
12. What are the reasons for failure of the EMS in your company?
- | | |
|---|-----------------------------------|
| a. Lack of experience [] | b. Lack of personnel training [] |
| c. High cost of certification [] | d. Lack of planning [] |
| e. Inadequate management involvement [] | f. Can't tell [] |
| g. Others... <i>N.F. failed</i> [] | |

13. What are the reasons for success of the EMS in your company?
 a. Experience with other management systems []
 b. Management commitment and Involvement []
 c. Training workers acquired []
 d. Advance Planning []
 e. Can't tell []
 f. Others []
14. What are the benefits you derived or hope to derive from EMS implementation?
 a. *EMS provides the proper guideline and roadmap*
 b. *to implement the process.....*
EMS also provides ~~proper~~ scope for advanced & preventive maintenance
15. How has EMS impacted your company's overall performance in terms of creating comparative advantage?
 a. Decreased []
 b. Slightly decreased []
 c. No change []
 d. Slightly increases []
 e. Increased [✓]
 f. Can't tell []
16. If it has decreased, what are the causes?
 a. Government legislation []
 b. Inadequate management awareness []
 c. Low market access []
 d. Inadequate customer awareness []
 e. Can't Tell []
 f. *Other... Not Demand..... []*
17. If it has increased, what has brought this increment?
 a. Penetration of other markets []
 b. Increased market share []
 c. Cost reduction []
 d. Waste reduction []
 e. Reduction of fines and legal fees []
 f. Can't tell []
 g. *Other... As a global company [] it provides example for our group company compliance as well.*
18. Has the competence in your company staff in EMS increased since implementation
 a. Yes [✓]
 b. No []
19. Has the attitude of the staff towards environmental work changed during the process
 a. Yes [✓]
 b. No []
20. If yes, how? *Awareness improved and work process changed*
21. If no, why? *N/A*

22. Did you effect changes in the products after implementation?
 a. Yes [] b. No

D. BARRIERS

23. What kind of impediments/barriers have you met in your process of EMS implementation?
- a. High investment required [] b. Management ignorance of its existenc
 c. Long time of certification [] d. Lack of government incentives []
 e. Ignorance of regulations [] f. Can't tell []
 g. Other..... []
24. What is your perception regarding the difficulty of obtaining ISO 14001 certification?
 a. Very easy [] b. Easy [] c. No problem
 d. Somehow difficult [] e. Very difficult []

E. COMPLIANCE TO LOCAL LEGISLATION

25. Has your company taken environmental issues as important in its operation?
 a. Yes b. No []
26. Would you say your organization's activity has an impact on the environment?
 a. Yes b. No [] c. Can't Tell []
But managed through EMS.
27. Are these impacts positive or negative?
 a. Positive [] b. Negative [] c. Can't tell
28. Which environmental regulations have you been complying with?
 a. *not known* []
 b. []
29. Kindly give suggestions to improve EMS certification in Bangladesh
 a. *Awareness program* []
 b. *Regulate monitoring & legislative regulation* [] *implementation*

THANK YOU VERY MUCH FOR YOUR SUPPORT

Annexure II: Frequency distribution of EMS in practice in different types of manufacturing industries of Bangladesh

	Eco-labelling & Waste mgmt system	Energy Conservation	ISO 14001:2004	ISO 14001:2004, Energy Conservation, Waste mgmt system	None	UFS	Waste mgmt system	Waste mgmt system & Energy conservation	
Cement	0	0	1	0	0	0	0	0	1
Chemical	0	0	0	0	0	0	1	0	1
Cotton Textile	0	0	0	0	0	0	4	0	4
Detergent	1	0	0	0	0	0	0	0	1
Electrical, Electronics and Automobile	0	0	1	0	0	0	0	0	1
Fertilizer	0	0	1	0	0	0	0	0	1
Food production and Processing	0	0	1	0	0	0	7	0	8
Gases and Welding Electrode Manufacturing	0	0	0	0	0	0	1	0	1
Gases Manufacturing	0	0	0	0	0	0	1	0	1
Lead Acid Battery	0	0	1	0	0	0	0	0	1
NSD Powder and Bar	0	0	0	0	0	1	0	0	1
Oil and Gas	0	0	1	0	0	0	0	0	1
Paper	0	0	0	0	0	0	1	0	1
Pharmaceuticals	0	0	0	0	1	0	1	0	2
Plastic Products	0	0	0	1	0	0	0	3	4
Power equipment	0	0	1	0	0	0	0	0	1
Ship dry docking	0	0	0	0	1	0	0	0	1
Shipyard	0	0	1	0	0	0	0	0	1
Steel	0	1	0	0	1	0	0	0	2
	1	1	8	1	3	1	16	3	34